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FINAL REPORT

**IMPACT OF ENDANGERED SPECIES LEGISLATION ON
SASKATCHEWAN AGRICULTURAL PRACTICES**

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IMPACT OF ENDANGERED SPECIES LEGISLATION
ON
SASKATCHEWAN AGRICULTURAL PRACTICES

FINAL REPORT

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ABSTRACT

The purpose of this project is to measure the economic impacts that legislation protecting endangered species will have on agricultural practices in Saskatchewan. This project will focus on endangered species in pastureland. A second objective will be to provide alternative methods of achieving species protection other than those outlined in Bill C-65 of the Second Session of the Thirty fifth Parliament, the **Canadian Endangered Species Act** (the Bill), one of which alternatives will be the **Saskatchewan Wildlife Act** (the Sask. Act). Hyperbole and hysteria on both sides characterize the current debate about the effects of the Bill on farmers and ranchers in Saskatchewan. That the Bill can effect costs and thus management decisions is certain. This report assesses the extent of these costs by resorting to the price necessary to bribe farmers/ranchers to increase habitat.

The Bill's purpose is the protection of bio-diversity through the conservation of endangered species which is to be achieved by a species by species procedure which mirrors the one adopted by the United States under the **Endangered Species Act 1973** (the Act). Our results suggest that the Bill and the Act share an institutional framework in which they operate that is sufficiently similar to suggest that only a difference in the perception of the social costs of noncompliance would alter the results witnessed in the United States. Our analysis of our survey results suggests that such a difference in social costs does not appear to exist. The project explores a system of more generally protecting habitat.

EXECUTIVE SUMMARY

Assessing the likely effect of new prohibitive regulations essentially requires three predictions. The assessor must predict the interpretation that the courts will place on the legislation, what resources the regulated believe the regulators will commit to enforcement and the likelihood of citizen compliance.

Compliance, following Becker, can be modeled as a comparison of the expected benefits of noncompliance to the expected costs of noncompliance. That is, if the costs an agent expects to avoid through noncompliance are greater than the probability of being held liable for noncompliance times the costs of the penalty plus any associated costs of defense such as legal fees and any social costs the agent may face, the agent will choose not to comply. As the probability of attracting liability and the extent of the social costs are the unknowns that underlie this decision, the compliance decision will depend upon citizens' beliefs respecting these two unknowns.

The commitment of resources to enforcement appears, following Dixit, amenable to modeling as a multi-task, multi-principal agent problem. That is, the low powered nature of the incentives available to most agents in the system make it difficult to arrive at a first best allocation of resources to enforcement. By enforcement we mean all aspects of enforcement, such as listing and de-listing, not merely detection of those who breach the provisions of Bill C-65 of the Second Session of the Thirty fifth Parliament, the **Canadian Endangered Species Act (the Bill)**. This problem will be exacerbated if

private landowners, acting opportunistically, either refuse to provide regulators with information, or provide them with false information. The regulated should be able to use such a model to form rational expectations of the regulator's commitment of resources.

Our review of the United State's experience under the **Endangered Species Act 1973** (the Act) suggests that citizens and regulators appear to conform to the Becker and Dixit models respectively. The appropriateness of the Act as a model for the Bill comes to the very heart of much of the apparent controversy surrounding the Bill. Specifically, much of the concern over the Bill tends to arise out of its potential applicability to private property. This debate seems to be centered on how broadly the word "residence" is likely to be interpreted by the courts, and how wide a latitude the courts will be prepared to grant under section 33 of the Bill, for a species to be defined as migratory and thus subjecting private property to the Bill. As a credible argument can be made for an interpretation of the Bill that allows it to apply to private property, and by assuming that citizens form expectations of the future rationally, they will assume that the Bill applies to private property. This renders the Act a reasonable model for the Bill. Our analysis of the survey data, we have gathered, suggests that the Bill and indeed the Sask. Act can be expected to face problems similar to the United States experience with the Act.

Our work suggests that should the Bill be reintroduced in Parliament and passed in its present form that it will likely not prove particularly successful. The Bill seems to have been met with a great deal of private landowner skepticism where it has not been met with outright hostility. Neither have conservation groups always roundly endorsed

the Bill. It is our suspicion that a lot of these popular concern flows from the fact that the Bill adopts a species by species protection plan similar to that of the Act. As the Act has often been popularly portrayed as an expensive and unsuccessful at protecting species red tape bureaucratic mine field, an alternative approach may have been preferable.

It is our contention that as the perceived primary cause of the endangered species problem is loss of habitat, that to pursue endangered species protection principally as a land use issue rather than on a species by species basis would be a more appropriate way to approach the problem. To this end we can show theoretically that policies that affect either the revenue from certain land uses or the cost structure associated with certain land uses can be expected to increase available habitat. It is also possible to show, in theory, that the manner in which a policy forces costs to be borne can affect the efficacy of a policy. That is, policies which force payment on the few for the benefit of the many can only be expected to succeed if the few have no way of avoiding the costs or if they can pass them on to the many.

1.0 INTRODUCTION

So why might society face a crisis of extinction of flora and fauna species? The consensus amongst biologists seems to be that the plant and animal species are being driven to extinction because they are running out of room in which to live (See for example Mann and Plummer (1996), or Clark, Reading and Clarke (1994)). That is plants and animals require habitat, and they are competing with humanity for the land where their habitat is found. This has led biologists and conservationists to argue that the current epidemic of extinctions that humanity faces is of a different character than the extinctions of prehistory like that of the dinosaurs (See for example Mann and Plummer (1996), or Clark, Reading and Clarke (1994)). These extinctions have a different tenor to them. Rather than being the result of some alteration of the environment due to some natural phenomena like an ice age they are seen as due to human pressure on other species caused by competition for space. For example consider bison which were all but driven from the Great North American Plain so that settlers would not have to put up with millions of large wild ungulates roaming through their fields on the animals whim. The current spate of extinctions is thus seen to be based largely in the notion that endangered species apparently do not compete particularly well with humans for access to the resources they need to survive. Swanson argues that humanity now has sufficient control over the biosphere that: "human decisions on resource allocation will determine which life forms will continue to exist into the future" (Swanson 1994 p. 819).

In much more dramatic language Mann and Plummer have expressed a similar idea as follows:

In the role of modern Noahs, we face momentous choices. We want to load endangered species on our ark, but the task must compete for scarce resources with other worthy projects. Because we are acting from human impulse rather than on the orders of a Supreme Deity, we don't have blueprints for our conduct or, for that matter, the ark we are trying to build. We don't even know the numbers of potential passengers, although we know that whatever ark we choose to build will be unable to accommodate everything. What will be saved and what will be left behind? There is no automatic answer.

Few individual situations are foreordained. If the nation wants to, it can buy outright the pine barrens and oak savanna needed by the Karner Blue butterfly; or it can build a new hospital to serve the Choctaws who live on the wrong side of the Sans Bois Mountains in Oklahoma; or it can dismantle the dams that block full recovery of the snail darter. It can do any of these things, but not all of them at once. Each of these actions diminishes our capacity to take other worthwhile actions. It is easy to say that society should extract money from developers and give it to black-capped vireos that need protection. But it is not possible to do this and simultaneously ensure that good housing is available and affordable to everyone. Or good health care, for that matter, or a good education. Embracing the goal of saving biodiversity and the goals of providing housing, health care and education, as well as the many other goals we have taken up during the past two hundred years, makes our choice difficult. (Mann and Plummer p.212-13)

Thus, the problem appears to be one, from an anthropomorphic view, of allocating scarce resources, particularly land, between competing ends. In the case of land, this would amount to choosing between non-human habitat and the countless human demands for land such as farmland, timberland and cities, with their hospitals, schools and countless other infrastructure facilities. The basic argument alleges that if this allocation does not insure that sufficient other species' habitat exists, to maintain

species at risk, neither does it maintain a level of biodiversity that is sufficient to guarantee that human existence is sustainable over time (Mann and Plummer 1996). Viewed in this light the endangered species problem appears to be a problem that economics can shed some light upon.

In response to this problem the Government of Canada in the Second Session of the Thirty-fifth Canadian Parliament introduced Bill C-65 of the session entitled, the **Canadian Endangered Species Act** (hereinafter the Bill). The Bill died on the order paper with the calling of the nineteen hundred and ninety-seven Canadian federal election. Despite the promise of the returning government to reintroduce the Bill, that has not happened to this date. The concept of endangered species protection legislation has subsequently been the subject of a substantial number of consultations between the federal and provincial government officials and stakeholder groups. These consultations were most likely prompted by the large dissatisfaction expressed with the Bill to the extraordinary committee that held hearings across the country with respect following its first reading. A great deal of the discontent that surrounds the Bill appears to stem from the perceived similarity between the Bill and the United State's **Endangered Species Act, 1973** (hereinafter the Act) that has proved to be of limited effectiveness since it became law in nineteen hundred and seventy-three.

It will be argued herein that the mere presence of an endangered species problem is an indication that the problem is the result of institutional failure. It will be argued that

institutions have failed at not only a national level but at an international level as well. It will be hypothesized that the Bill will not prove effective in reversing biodiversity loss, that is, that adopting prohibitive policy will not prove the correct way to amend the institutional failure. Ascertaining the attitudes of Saskatchewan agricultural landowners with respect to compliance will test this hypothesis. Finally alternative institutional arrangements will be examined.

These arguments will be made by examining the policies, in the developed North American economies, that affect habitat preservation, either positively or negatively. Once an appreciation of the policies is attained the institutional structure used to adopt those policies and the incentive structure that such institutions put in place can be examined. It should then be possible, using economic theory and the results of the survey, to ascertain the likely effectiveness of new institutions to achieve their policy goals and to assess their associated costs.

2.0 BACKGROUND

As was averred earlier, Swanson argues that humanity now can essentially control nature (Swanson 1994). While the roots of Swanson's claim lie deep in antiquity the readily apparent manifestation of this ability is a post Industrial Revolution phenomena. The transition from the hunter-gather societies of the Stone Age to the world we witness in today's Information Age is the story of humanity's ever increasingly successful attempts to first exploit nature, then to harness nature and finally to control nature. It is simultaneously the story of mankind's ever expanding technological ability, and our apparently expanding, though admittedly limited, ability to understand the forces with which we deal. Finally, it is also the story of our increasing, in material terms, standard of living, and the accompanying increases in life expectancy and population.

While this transition was millennia in the making it is only relatively recently, from an historical perspective, that humanity has undertaken the wholesale subjection of nature. The often cited rise in atmospheric carbon dioxide levels is a post sixteenth century phenomenon, as is the rise of commercial agriculture. The scientific revolution and the liberal enlightenment transformed England from a feudal to industrial society, with the rest of the western world following closely behind. With industrialization came a marked increase in material wealth, and in population. This, of course, led to increased demand for food and the expansion of land dedicated to agricultural production, and

ultimately to decreased habitat for non-human species. It has been argued that this loss of habitat has lead to a level of non-human species extinction that is apparently unprecedented without an accompanying cataclysmic event such as an ice age (Clark, Reading and Clarke 1994).

Concern with diminishing biodiversity can be founded in at least three ways. The concerns can be ethical. That is the ethics of driving other species, even the small pox virus, is questioned. The basic gist of the argument is that humanity cannot morally drive another species to extinction. The other two arguments take a much more anthropomorphic point of view. The first is the concern that a potentially valuable life form may become extinct before humanity can exploit it. Hence, pharmaceutical companies running around the world seeking traditional remedies and testing the ingredients for medicinal value. Secondly, the environment acts as a sink for the wastes humans produce. An ecosystem's resilience, its ability to recover from the insult that industrial society level against it, is thought to be a function of its diversity. That is, the more diverse an ecosystem the harder humans have to try to destroy it. Endangered species, in this context, are a proxy for biodiversity. Much as the death of caged canaries were once used to indicate an air quality, in coal mines, harmful to human miners, this argument runs that as more and more species become extinct, the level of biodiversity must also fall, perhaps even ultimately to a state incapable of supporting human existence. Unfortunately, it appears that humanity has been trying rather hard to kill off the canaries.

In Clark, Reading and Clarke's first paragraph they aver that the planet faces an extinction explosion of historic proportions. In what they claim to be conservative projections of species loss, they cite estimates of losses in the neighborhood of ten percent of the planet's biodiversity in the next ten to thirty years. This would suggest species losses at a rate of one hundred or more species per day, worldwide. They then turn to the United States and suggest that 675 plant species may become extinct in the United States before the year 2000. They further claim that about one-third of fresh water fish species in the United States are endangered due to habitat degradation. According to these authors up to 3000 species maybe candidates for listing and protection within the Act and that out of that 3000 as many as 300 may already be extinct or may become extinct prior to listing because of the resource constraints faced by the services. Finally they observe that fewer than one-half dozen endangered species have recovered under the Act (Clark, Reading and Clarke p.3).

While Mann and Plummer cast some doubt upon the use of a species area curve, a hypothesis that the number of species that a particular area of land can house is a function of the area in the form $S=cA^z$, where S is the number of species, c and z are constants and A is land area, to derive predictions of the likelihood and rates of extinction, the predominant methodology for deriving such estimates, they conclude:

We face, in sum, not the onrushing, all-destroying wave of extinction described by $S=cA^z$, but an immense aggregation of small, individual situations that is not reducible to a simple equation. These situations are nudging a large (though exactly how large is unknowable)

fraction of North American biodiversity down the path toward extinction. Predicting the exact time of arrival is less important than recognizing our direction of travel and that we are picking up speed *now*. In other words, our biodiversity problem is better thought of in terms of endangerment today than extinction tomorrow. Although the latter will surely occur if the former is not controlled, we have time for considered action, not panicky reaction. (Mann and Plummer pp.79-80)

This clearly reinforces the notion that we are in the presence of a grave situation. That this crisis is largely the result of habitat loss is largely uncontested. The Globe and Mail of February 24, 1999, suggests that 80% of species at risk, in Canada, are at risk because of habitat loss. This implies successful attempts to limit species loss will ultimately depend upon some form of habitat protection and thus affect land use policies. It also implies, of course, that there is some space to attempt to cease the over exploitation of species that account for the remaining 20% of the threatened species.

Recent history has shown attempts at both forms of protecting species, at an international level and by individual nation states. In North America, the United States has adopted the Act, while in Canada the Federal Government has yet to legislate it, as has been noted earlier, continues to study the problem seeking solutions of which the Bill is the potential solution that has proceeded farthest down the legislative path. Given the federal nature of the Canadian Constitution, which will be examined later, it should not be surprising that the provinces have entered the legislative field in the federal government's absence. Saskatchewan, in particular, has adopted legislation that will clearly render the acts of killing or harming endangered species unlawful; the extent to which habitat, particularly privately held, will be protected is not clear.

The international attempts have taken two different tactics. The earlier was an attempt to limit hunting, and particularly poaching, of endangered species by attempting to limit the market for the poached species or its body parts. This was principally done through the **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)**. The treaty adopted in 1973 regulates trade in species with a listing procedure. It makes it illegal to trade in any species or parts of a species listed in Appendix I of the treaty, those species in immediate risk of extinction. CITES also sets out the rules under which trade can be undertaken in other species at lesser risk, those species are listed in Appendix II of the treaty. CITES essentially attempts to halt the poaching of endangered species by drying up the market for the illegally obtained species. The Species Survival Network estimates that over one half of the estimated ten billion American dollar world wide trade in wildlife continues to be illegal, and is only superceded by the drug trade in the illegal world economy (Perrine 1997). It is interesting to note that CITES attempts to eliminate demand, while our much publicized war on drugs attempt to interdict supply. One feature of the Convention that bears particular notice is that it does not establish an extraterritorial enforcement mechanism. It is the responsibility of each signatory to the treaty to enforce its terms domestically. Considering the disparate wealth and policing abilities of the nations of the world, inconsistent enforcement is to be expected. The still booming Asian folk remedies market being a prime example.

The more recent international action came with the **Convention of Biodiversity** from the Rio Summit in 1992. The basic focus of the Convention is the undertaking of signatories to take domestic measures to ensure that biodiversity remains at a level that will sustain continued human existence. Again, as with CITES the Convention lacks an international enforcement mechanism and again given the disparity between nations mixed results are to be expected.

Given the problem of international enforcement with both CITES and the Convention, not to mention other international environmental agreements, like the **Kyoto Accord**, proposals might be put forward at future World Trade Organization rounds to allow trade sanctions to be taken against nation states that fail to comply with their obligations under the environmental treaties. There is precedent for this sort of position in the green box exemptions in the Agreement on Agriculture that came out of the last GATT round. Gray, Romain and Furtan have clearly demonstrated how international trade rules can have profound effects on a nation's, or in the case of Canada a province's domestic policy position (Gray, Romain and Furtan 1999).

While the international agreements suffer from the lack of effective enforcement mechanisms, the same can not be said for a nation states domestic regulation. A nation, should it choose, can utilize the state's monopoly on coercion to attempt to achieve the policy goals it chooses to specify. The only serious question then becomes whether or not the policy prescription will be successful within the institutional structure in which it

was placed. A good example of this is the history of nonhuman species protection in the United States.

The **Endangered Species Act, 1973** (the Act) is the present manner in which endangered species are protected in the United States. It is a piece of legislation with few friends. It is decried by landowners who see it as expensive and overly intrusive, and by conservationists who see it as ponderous and of questionable effectiveness. Whatever its faults maybe, the Act is the culmination of legislative interventions in the United States for the protection of nonhuman species that began with this century. It essentially adopts a process by which a species is entitled to the protections under the Act, which include habitat protection, upon the species being listed. Listing is a scientific determination that the species' numbers are such that it falls within the statutory definitions of endangered. Once this occurs the species and its habitat are protected. The Act in its present form stands as a culmination of three-quarters of a century of United States Government legislative intervention to protect nonhuman species.

United States federal protection of endangered species essentially began as a response to the rapid decline of the passenger pigeon with, in 1900, the passage of the **Lacey Act**, designed to allow the Secretary of Agriculture to adopt measures to protect game, and other wild, birds (Clark p.19). This was followed by the **Migratory Bird Treaty Act of 1918**, and the **Migratory Bird Conservation Act of 1929** (Clark pp.19-20). It bears notice that these early pieces of conservation legislation were, by and large,

attempts to facilitate sport hunting of waterfowl and upland game birds. In this regard, much of the support for these legislative initiatives came from hunter/conservation groups; much like groups like Ducks Unlimited today.

The early 1960's saw a marked change in the philosophy driving conservation. As Clark observes:

Slowly, political and public awareness of the growing problem of endangered species began to increase. The environmental activism of the early 1960's accelerated this growing awareness, and in 1964 the Department of Interior's Bureau of Sport Fisheries and Wildlife (now the U.S. Fish and Wildlife Service) formed the Committee on Rare and Endangered Wildlife Species. Based on the work of this committee, the Department of Interior published "Redbook-Rare and Endangered Fish and Wildlife of the United States-Preliminary Draft." This 1964 publication, more commonly known as the "Redbook," contained the first official listing of species the federal government considered to be in danger of extinction.

Two years later, Congress passed its first comprehensive endangered species legislation: the Endangered Species Protection Act of 1966. Though espousing the lofty goal of "conserving, protecting, restoring and propagating selected species of native fish and wildlife"(Section 2(a)), the 1966 act did little except authorize efforts to acquire important habitat. Congress soon recognized the inherent weakness of this act and replaced it with the Endangered Species Conservation Act of 1969. This replacement act extended protection to certain invertebrates, increased prohibitions on illegal trade, and began the process that culminated in the Convention on International Trade in Endangered Species of Wild Fauna and Flora. (Clark p.20)

One of the strongest voiced objections to the **Endangered Species Protection Act** (the 1969 Act) was that while it required the federal government's development agencies such as the Army Corps of Engineers to be cognizant of the effects of their projects on endangered species, it really did not require them to do any thing beyond consult with the Fish and Wildlife Service and thus the perception was that the development agencies

were proceeding with their own agendas with no real regard for endangered species. The 1969 Act also made some allowances for commercial interests, particularly furriers and trappers. Yaffe argues in the third chapter of his book that these sorts of concerns were driving forces behind the repeal of the 1969 Act and the enactment of the Act (Yaffe pp.32-57).

The philosophical change that was encompassed in the Act was, in the view of Mann and Plummer, an abandonment of conservation where practicable in favor of perfect duty owed by humanity to biodiversity. As they observe:

Whatever the cost-the Court[United States Supreme Court in Tennessee Valley Authority v Hill (98 S.C.R. 2279 (1978))] was saying something of almost embarrassing obviousness. By enacting a law that eliminated the practicable, Congress had with little discussion or debate created a perfect duty to biodiversity. Although Allen[the Audubon Society biologist] believed that people care about endangered species "for reasons peculiarly our own," the act embraced the Noah Principle, which abjured human aspirations. The nation's natural heritage must be saved, no matter what. The implications of that commitment soon stared Congress in the face-and it blinked. (Mann and Plummer p.169)

It is the perfect duty owed in favor of biodiversity by humanity, that Mann and Plummer see as driving the Act, and which largely fuels their discontent with the legislation.

Finally, it should be noted that while the Act is clearly the corner stone of American biodiversity protection law, it is not the only stone in the structure. Clark lists the following United States federal statutes as forming part of the structure: the **Marine Protection Act of 1972**, **National Forest Management Act of 1976**, **Conservation Programs on Military Land (1988)**, **Institute of Tropical Forestry Act (1990)**, and

Driftnet Act Amendments of 1990 (Clark p.20). Clark further notes that there are also state and local statutes and international conventions that enter into the picture (Clark p.21). Clark goes even further and points out that the activities of private groups such as the Nature Conservancy and Duck Unlimited enter into the mix through their entering into agreements with various levels of government, that is through things like the **North American Waterfowl Management Plan** (Clark p.21).

The Act is the cornerstone of the policy and as such is the focus of this analysis. The sections of the Act of particular interest are 2, 3, 4, 6, 7, 9, 10, and 11.

Section 2 is the purposes section. The purpose is really quite simple. It is to protect the ecosystems housing endangered and threatened species so that those species can be preserved. It is also a purpose of the Act that all federal departments and agencies should promote biodiversity conservation.

Section 3 is the statutory dictionary. The only thing of particular note here is that sub-species are included in the definition of species. Species are the unit of conservation, therefore sub-species can also attract the protection of the Act.

Section 4 is the meat and bones of the Act. Section 4 delineates the listing process. The same criterion applies to both listing and delisting. The process is commenced by a petition by an individual or a group or on the initiative of the Fish and

Wildlife Service or the National Marine Fisheries Service, the bodies charged with the Act's administration. The section establishes a ninety-day period from the date of the petition for the service to decide if the petition presents sufficient information to determine that listing may be warranted. If the service determines that listing may be warranted it has one year from the date of the petition to make the decision whether or not listing is warranted. Should the service determine that listing is warranted the species is listed, unless service action on other listing proposals precludes immediate action. In making these determinations the service is to rely upon the best available scientific data as to the numbers of the petitioned species and to the threats or risks that it faces. It should be noted that the economic consequences of listing are not to be considered by the service. This was made extremely clear by the United States Chief Justice Burger, when speaking for the majority of the United States Supreme Court, in **Tennessee Valley**

Authority v Hill he said:

The plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost. (98 S.C.R. 2279 (1978) at p. 2297)

The section also, currently, allows for public hearings and emergency listing.

Section 6 sets out the requirement for cooperation with the states. This is largely to be facilitated through federal/state agreements. Management agreements are the principle tool, that is agreements where the state agrees to look after some habitat and the federal government pays up to three quarters of the costs of habitat acquisition and management.

Section 7 sets out the requirement that no federal department or agency can do or fund any activity that would place a listed species in danger. This section was amended in 1978 to allow for the creation of the so-called "God Committee". This is a committee formed by the Secretary of Agriculture, Secretary of the Army, Chairman of the Council of Economic Advisors, Administrator of the Environmental Protection Agency, Secretary of the Interior, Administrator of the National Oceanographic and Atmospheric Institute, and one member from each affected state to be appointed by the President. This committee has the power to exempt a particular federal project, following a relatively formidable appeals procedure, from the operation of the Act.

Section 9 is the prohibitive section. Basically it sets out that you cannot do anything adverse to the health or welfare of any listed species. It also explicitly protects the necessary habitat.

Section 10 provides the exemptions to the Act. There is an exemption for scientific study including captive breeding programs. There is a short-term exemption for economic hardship caused by listing, which seems to potentially apply only to hunter gathers. In the 1982 amendments to the Act an exemption was granted for a development plan, that would allow for destruction of habitat and incidental taking of listed species. Basically the plan has to show that a listed species will remain viable. Given the nature of listed species this is of course no simple task.

Section 11 sets out the penalties. Simply put, after a hearing the Secretary of the Interior can level a civil penalty of up to ten thousand dollars per violation. In the event that criminal charges are laid, depending upon the charge the maximum fine can be ten or twenty thousand dollars and/or up to six months or one year imprisonment respectively.

So how has the Act fared? To President Nixon and the members of Congress, in 1973, the protection of biodiversity must have seemed a policy as good and benevolent as motherhood and apple pie. The Act was passed and proclaimed with nary a whimper of dissent to be heard above the self congratulatory back slapping on Capitol Hill and in the White House. In the nearly twenty-five years that have followed enactment the voices of discontent with the Act have become a veritable roar. The dissatisfaction with the Act crosses the political spectrum, albeit for substantially different reasons. The conservationists bemoan what they see as the Act's glaring failures: few species listed, the length of time required for listing, the fact that delistings due to extinction outnumber delistings due to recovery, among others. On the other hand, those who take a more humanistic view of the operation of the Act attack what they perceive as the Act's over broad affect on their lives and businesses, with complaints such as: why should a fish stop the Tennessee Valley Authority from using a substantially completed dam, why should a butterfly stop Wilton, New York from spraying for mosquitoes, why should a beetle stop the State of Oklahoma from building a road to a hospital.

The extent of the current dissatisfaction with the Act can easily be seen by considering the indictment of the Act offered by Clark, Reading and Clarke, and by Mann and Plummer. Following a depressing paragraph about "a few statistics about the endangered species problem" (Clark, Reading and Clarke p.3), Clark, Reading and Clarke go on to say:

Are there plausible explanations for these dismal facts? Perhaps the ESA is an unworkable law; perhaps it addresses elements and processes that have no bearing on the disappearance of species. Another possibility is that extinction is inevitable given the scale and pace of human alteration of landscapes and no herculean human efforts can stop its course. Or perhaps it is simply that the implementation of the existing law has been weak- . . . (Clark, Reading and Clarke p.3)

Whereas, Mann and Plummer offer a somewhat different account:

In Robert Allen's day, the law imposed few duties toward biodiversity. When he traveled to Aransas, his expenses were paid by his employer, the National Audubon Society, a private organization; when he convinced the helicopter pilot to fly him near the whooper's breeding grounds, he used persuasion, not the coercive force of the state; and when he exhorted others to join his crusade, he drew on the love for the crane shared by his fellow biologists, naturalists, and citizens in Canada and the United States-but he could not order people to change the way they lived. People helped him because they thought saving the crane was good and virtuous, not because they had a legal obligation to participate.

Since that time, laws like the Endangered Species Act have expanded our obligations, pushing them closer to the realm of perfect duties. Moving away from the old balance is surely good in principle, because in the past our legal system did not nudge us to remember our natural heritage and thereby may have helped to encourage thoughtless waste. At the same time, one can wonder whether our laws today strike the proper balance among goods (that is, whether they are ethical), and whether they respect the importance of having appropriate means (that is, whether they are practicable).

A clue to the answer came during our visit to Florida. After visiting the cranes, we drove to a restaurant a few miles away with Stephen Nesbitt, the biologist. The restaurant looked like any farmland eatery: faded tablecloths of red-and-white plaid, a plethora of calendars on the wall, pickup trucks in the parking lot. The room was full of burly

men who looked as if they worked outdoors. To our surprise, heads swiveled in our direction when we entered. The object of the stares was not us, the two strangers with notebooks, but Nesbitt, in his Game and Freshwater Fish uniform. . . .

Along the way, it occurred to us that matters had gone awry. Ranchers, farmers, loggers, and the like live in rural places because they love the outdoors and its inhabitants. Nesbitt was a biologist for precisely the same reason. Yet Nesbitt's uniform set them off. Something about the simple presence of someone associated with government-organized efforts to preserve wild areas attracted hostility from the very people who live there. (Mann and Plummer pp. 145-146)

What prompted this change in the way that the Act is viewed? It will be argued herein that the change resulted from the failure of Congress to consider people. It is the bureaucrats of the United States Department of the Interior Fish and Wildlife Service and the National Marine Fisheries Service who are largely responsible for the implementation of the Act. It is the American resident who has his or her property and way of life affected by the operation of the Act. Congress, apparently, neglected to consider these facts and thus the Act has become a piece of legislation decried by many, lauded by few.

How has this dissatisfaction with the Act been expressed? Mann and Plummer observe:

As a result they had a great incentive to ensure that official endangered species never appeared on their property. The implications of this were demonstrated in an extreme form by the case of the San Diego mesa mint, which the Fish and Wildlife Service proposed listing in October 1978. One of the plant's three populations inhabited a 279-acre tract on which Pardee Construction of San Diego intended to erect a 1,429-unit subdivision. Pardee had asked the Veterans Administration to provide a loan guarantee. A few days before the mesa mint was added to the list, the VA informed the developer that the plant lived on the site; Pardee

promptly bulldozed the population while it was still unprotected. After a few angry letters, the company got a VA loan guarantee-no endangered species existed on the property to disrupt construction. (Mann and Plummer p. 187)

If people will race the listing process to be rid of an endangered species is there any reason to believe that losing the race will alter their behavior, particularly if there is a good chance that the presence of the listed species is unknown?

While the incorporation, in the Act, of an incentive perverse to its purpose is sufficient to generate concern among conservationists it is not the only concern expressed in relation to the Act and its goals of protecting endangered flora and fauna regardless of cost. Clark suggests that the Act's implementation can be criticized on the following grounds: 1) Imprecise standards for delineating species status; 2) Inappropriate units of protection, that is species rather than ecosystems; 3) Undue attention to high profile species; 4) Insufficient protection of habitat; 5) Inadequacy of the recovery plan process; 6) Inadequate interagency consultation; 7) Inappropriate discounting for uncertainty; 8) Insufficient consideration of economic factors (Clark pp.30-35).

In his proposed solutions to these eight problems Clark notes three more problems: 1) Insufficient resource allocation; 2) Too much discretion granted to the implementing agencies; 3) Extensive politicization of the system (Clark pp.36-38). It seems that extensive politicization of the system in fact underlies all to the other complaints in Clark's indictment of the Act.

This is the situation that the Government of Canada found itself in, in 1996; the world appears to have achieved a level of biodiversity that renders continued human existence at current levels of consumption problematic, the international attempts to deal with the problem are plagued with inherent enforcement problems, and the closest model for dealing with the problem, on a nation level, is the highly controversial one adopted by the United States. In response to these circumstances the Government of Canada introduced Bill C-65 of the Second Session of the Thirty fifth Parliament, the **Canadian Endangered Species Act** (the Bill). The Bill died on the order paper with the calling of the 1997 Canadian Federal Election. The Government of Canada has promised to reintroduce similar legislation. The present challenge is to attempt to determine the wisdom of the Government of Canada's choices.

3.0 THEORETICAL CONSIDERATIONS

If the root of the endangered species problem is habitat loss and if land use decisions are made in self interest, why then have markets failed to provide the habitat necessary for the sustainable continuance of the human species? In other words, given that the habitat market has apparently failed, the question becomes what has caused the market for habitat to fail and what institutional problem underlies that failure?

The simplest answer would be that markets have not failed. This, of course, would require that our society have a utility function that ignores future generations. The fact that the popular press is consistently reporting polls that exhibit ever increasing environmental awareness belays the proposition that markets have not failed.

3.1 Market Failure

The Government of Canada upon examining the endangered species problem in nineteen hundred and ninety-six concluded that some form of governmental intervention was necessary to abate the habitat driven endangered species problem¹. To a neo-classical economist this implies that the Government of Canada had concluded that the market had failed to provide an optimal level of habitat. Market failure is the only

¹ This should not be taken to preclude the possibility that the Government of Canada was in large part responding to the environmental lobby.

justification for governmental intervention in the economy in the neo-classical economic paradigm².

Markets in the neo-classical welfare paradigm fail when they fail to achieve the Pareto optimal allocation of resources. This may occur for a variety of reasons. These reasons range from market power through any number of identified information problems to ill defined property rights.

This suboptimal allocation of goods and services is, in neo-classical economic theory, the result of inappropriate price signaling, or quantitative restrictions such as quotas. That is, as a result of the market failure the relative prices of the goods and services as revealed by the market are incorrect in that they do not reflect the relative scarcity of the things being traded. If habitat is under provided, theory suggests its relative price is too low, which is to say that the market is ascribing a price to habitat relative to other land uses that over values the alternative uses. This is a market failure.

What could lead the market to undervalue habitat relative to other land uses? First, the benefits of supplying habitat cannot entirely be captured by the supplier. For example, a private landowner is not able to charge individuals when endangered species exist on private property. There are information problems that result in the market under producing habitat. Biologists do not know the relationship between habitat and the

² See Boadway (1997) for a discussion of market failure in the context of stabilization and distribution objectives of government.

entropy reducing capabilities of ecosystems. In theoretical terms this means that marginal social cost of supplying habitat does not equal the marginal social benefit.

If the market fails in supplying habitat to the level where marginal social benefit equals marginal social cost, is this a prima facie case for government intervention? Governments also fail, especially when providing environmental goods because of the high transactions and information costs. The transactions costs literature takes a different view on the role of government when markets fail and when government intervention becomes justified. Therefore, a full discussion of transactions costs and property rights is required before answering this important question.

3.2 Transaction Costs

The term transaction costs is attributable to Ronald Coase. Transaction costs are quite simply those costs associated with conducting a transaction. They include a variety of costs, from the cost of finding a purchaser, to the cost of determining if what you received is what you contracted for, to the costs of determining if an employee is shirking. They are an economics analog of friction in the physical world. Just as friction affects the movement of physical objects, transactions costs affect the manner in which transactions occur and are governed within an economy. If the costs of conducting a transaction become too high the transaction may not occur. With transaction costs minimized the neoclassical economic competitive equilibrium results in an efficient

allocation of production and consumption within an economy. This is the so called Coase Theorem. Thus, apparent market failure must be examined in a new light.

Market failure must be examined in the context of all of the costs, including any costs that government imposes on the apparent market failure. Thus, it is possible that the only way that the apparent market failure can be relieved is by minimizing the transactions costs, including those imposed by government. Poorly designed policy can increase transactions costs and reduce the amount of goods and services produced. That is, relative prices actually discovered in the market may be different from actual relative scarcity because of transactions costs imposed by government and not because of the use of market power, or one of the other neo-classical causes of market failure. The price of failing to recognize the true cause of the problem and adopting an inappropriate governmental response may be to worsen a bad situation.

Oliver Williamson and others have advanced these concepts. The result has been that the neoclassical economic paradigm is left with a small and diminishing role in the evaluation of policies and events advanced and occurring in the real and theoretical world. The role is largely a comparative one, the actual result is compared to the standard set by the neoclassical result. Williamson's contributions include positing humans as boundedly rational and opportunistic as opposed to the neoclassical assumption of rational behavior (Williamson 1986). This has several important implications. First, time matters. What a bounded rational actor sees as his or her best

interest *ex ante* may not prove to be his or her best interest *ex post*. So long as he or she can take steps, the expected benefits of which exceed the expected costs to alter the *ex post* outcome along the way he or she will. Second, opportunism, defined as self interest with guile, effectively destroys the free and perfect information assumptions of neoclassical economic theory. Thus, information, its cost and its distribution becomes important in assessing efficiency. This point is driven home by Williamson (1983) and Akerlof (1970). Allowing for temporal effects and informational effects, the combination of which leads to uncertainty, is perhaps Williamson's greatest insight. People are going to attempt to choose a governance structure, for their affairs, which they believe will limit the transaction costs they face. In such a search the most important factor may well be to limit the ability of those with whom they interact to act opportunistically (Williamson 1986). It should be noted that while there is an ever expanding literature in economics on this subject, it is beyond the scope of this examination.

Finally it must always be recalled that transactions costs need not cause markets to fail. Indeed, transactions costs will always be present in any transaction even if they only extend to the time lost to go to a store. The true challenge of transactions costs is to achieve an institutional structure that minimizes them as their elimination is impossible.

3.3 Institutions

At their core, both market failure in the neo-classical sense and the failure to achieve the neo-classical equilibrium, are due to transactions costs. This amounts to an institutional structure that fails to achieve the assumptions of the neoclassical competitive equilibrium, and hence to an allocation of resources that is not consistent with that equilibrium.

Decisions respecting habitat that have led to a shortage of habitat are no different in this regard. Suboptimal levels of habitat arising in either a regulated or an unregulated market for habitat are the result of the decisions being made within an inappropriate institutional structure.

It is received theory that economic agents want as much as they can get for as little as they have to pay. This, of course, also implies that they will seek to lower any and all costs that they face and that they will not act out of altruism. When the assumption of opportunism is added, the agents are allowed to act with guile. That is, agents may attempt to take advantage of any opportunity that presents itself to them if they believe that they can get away with taking advantage of the opportunity. This implies that agents can act in a manner prior to a certain or expected event (their *ex ante* position) to insure that they are in the best possible position after the event (their *ex poste*

position). This end will be accomplished by utilizing any advantage, informational or otherwise, that they possess or can acquire even should it cause to worsen the *ex poste* position of other agent or agents in the economy. Thus, even agents who recognize that habitat is not available in sufficient quantities, a realization complicated by our poor grasp of how much habitat is indeed necessary, to sustain human existence will personally still demand less habitat than they believe necessary believing that they can free ride on that habitat supplied by others.

This is a result of the nature of habitat. Habitat viewed only as a necessary use of land for the preservation of human existence is in essence a public good. That is, habitat is something that the owner of the habitat cannot exclude others from enjoying the humanity maintaining biodiversity benefits that flow from the habitat. If someone is prepared to pay to provide some habitat because he or she gets some utility out of watching burrowing owls or some other species then all other member of society gain the biodiversity advantage to human existence accompanying that expenditure. The person who makes the original investment in the habitat has no way to extract from society any of the benefits it receives from that investment. Thus, a boundedly rational opportunistic agent will not invest in habitat, preferring others to make the investment from which he/she can extract the benefit. Unfortunately when everyone is boundedly rational and opportunistic, everyone will be inclined to make the same decision and thus there will be under investment in habitat. That is, as people free ride you get the classic under investment in the public good noted by economic theory. Therefore, even if society's

preferences change over time toward increased populations of endangered species, free riding could, but need not necessarily, result in continued under investment in habitat.

Whether or not the investment in habitat accorded by a change in societal preferences will achieve optimality will depend upon the relationship between the marginal societal benefit, the marginal private benefit, and the private marginal cost of habitat. It is undisputed in economic theory that in a free competitive market that individual economic agents will equate at the margin the benefit they receive to the cost they must incur to receive the benefit. Thus, following a change in preferences, it is possible that there will be a sufficient number of agents who sufficiently privately value habitat to overcome the free riders and arrive at a level of habitat sufficient to insure sustainable human existence. That this is not presently occurring is clearly evidenced, in an admittedly Stiglerian survivorship argument, by the fact that all the concern exists respecting endangered species. Thus, it appears that the ability to free ride has generated a free market outcome that generates a suboptimal allocation of habitat because of the wedge driven between private and social benefits at the margin by free riding.

Unfortunately, the tendency to free ride is not the only problem that can create a lowering of the relative price of habitat. Economic theory holds that the decisions on the use of land are going to be made, by a rational agent, on the basis of the highest value use to which the land can be put. That is, the rational agent is going to choose that use for the land which yields the greatest net present valued returns from the land to the agent. This

means that anything that can affect the price of the output of the land, like a deficiency payment for grain production, or the cost structure of a particular use, like a grain transportation subsidy, can affect the agents best use. Thus institutions in general and laws in particular will have an effect on how decisions are made. Policy regimes that distort the private agents' marginal benefit may distort land use decisions and thus can affect the amount of habitat available.

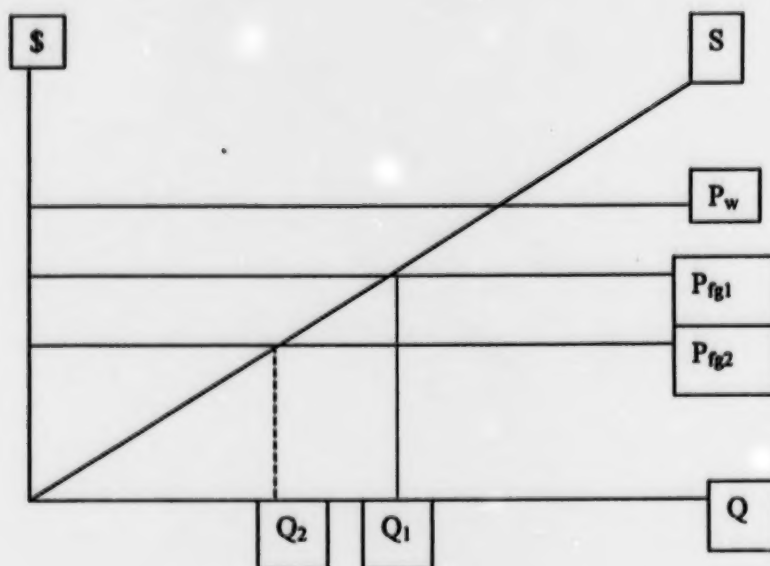
As the new institutional economics literature has developed two things have become eminently clear. The institutional environment that a decision-maker faces affects the decision made. Secondly, institutional environments are not consistent over geo-political boundaries or over time within a particular geo-political unit. Thus, as institutions change, the decisions of self interested decision-makers may also change. This is because the incentives, both positive and negative, that these decision-makers face change as the institutional environment changes. This further implies that as the decisions change the resulting allocation of resources change. Thus different institutional arrangements can result in different allocations even if identical decision-makers, under the different institutional arrangements, commence with a common endowment to take to the market. Thus the allocation of resources that an economy will ultimately arrive at will reflect both the individual actions of agents in the market and the collective action of these individuals in determining the institutional structure.

Thus in the agricultural region of Saskatchewan not only does the incentive for under investment associated with the free rider problem affect the amount of available habitat, but government policies can also have an effect. The Gross Revenue Insurance Plan and the grain transportation subsidy under the **Western Grain Transportation Act** both had negative effects on habitat prior to their repeals. This is because the rational economic agent is going to make land use decisions based on the costs and benefits that the agent actually sees. This can be exhibited by considering a landowner facing the decision of whether or not to place native short grass prairie under cultivation as wheat land or not. The landowner, as a perfect competitor, will make his production decision based on marginal cost pricing. That is, the landowner will want to cultivate only the number of acres necessary to give him the quantity of wheat such that the marginal cost of producing the last acre of wheat is equal to the price he actually receives for it at his farm gate. As the price that the farmer receives is the world price less the basis, which includes transportation cost, for any given world price the farm gate price in the absence of the transportation subsidy is going to be lower than the farm gate price in the presence of the subsidy by the amount of the subsidy. Hence, removal of the subsidy lowers farm gate price and, for a marginal cost pricer, will lower the optimal quantity of the good, say wheat, produced, and thus lower the demand for the factors of production necessary to produce the good. In the example of wheat one of those factors is land. Thus, in the absence of a transportation subsidy, short grass prairie is less likely to be put under cultivation. The case for the Gross Revenue Insurance Program is even simpler to see. For payment of a premium the Program would guarantee premium payers a contracted

quantity of production at a contracted price. This essentially establishes a return floor for any particular piece of ground. Given the relatively generous nature of the program land would have to have been pretty poor before a rational agent would opt away from cultivating it.

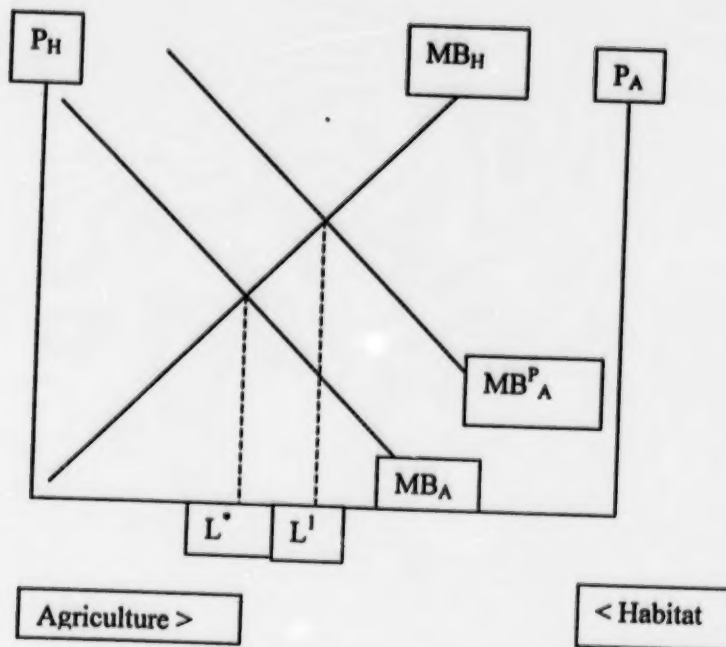
Graphically, for a transportation subsidy, this can be seen, in figure 3.4.1, by taking a production function for a composite field crop, Q , as a function of land, L , and some other composite input, x , such that $Q = f(L, x)$. Assuming that the producer is a perfect competitor yields a flat world price, p_w , that is anyone producer cannot affect the price. Subtracting the basis from that world price yields a farm gate price, p_{fg1} . Allowing then for an institutional change, removing a transportation subsidy, drops the farm gate price p_{fg2} . The removal of the subsidy shifts the amount of the composite field crop produced from Q_1 to Q_2 . Making the standard assumption that $f'_L > 0$, suggests that the amount of land dedicated to composite field crop production after removal of the subsidy, L_2 , must be less than the amount of land used for production of the composite field crop while the subsidy is in place, L_1 . These results can be fairly simply generalized mathematically using a Muth model. It bears notice that following the abandonment of GRIP and the transportation subsidy under the **Western Grain Transportation Act**, Saskatchewan Agriculture and Food reports that pasture acreage in the Province of Saskatchewan has increased by over three hundred thousand acres between one thousand nine hundred and ninety-one and ninety-six.

Figure 3.3.1



A, perhaps, more direct way to consider the same phenomena is exhibited in figure 4.3.2. At the equilibrium $MB_A = MB_H$ the social optimum, L^* , divides the total amount of land available into the optimal levels of habitat and agricultural land necessary for sustainable human existence. Where P_A and P_H are the price of land used for agriculture and habitat respectively, the curve MB_A represents that locus of points where the marginal private benefit of agriculture is equal to the marginal social benefit of agriculture and the curve MB_H represents the locus of points where the marginal social and private benefits of habitat are equal. If a transportation subsidy for agricultural products is enacted the marginal private benefit of agriculture, MB_A^P , becomes greater than the marginal social benefit of agriculture and shifts up and to the right generating the new suboptimal division of available land between agriculture and habitat, L^1 , which has more agricultural land and less habitat than L^* .

Figure 3.3.2



Thus, economic theory suggests two different causes that underlie the habitat loss driven endangered species problem. The first is, of course, the lack of institutional structures to address the free rider's disincentive to invest in a public good. The second and perhaps broader contributor being, the incentives to convert habitat to agricultural land inherent in the existing and recent institutional structures. It would seem that a policy bundle intended to solve the endangered species problem that ignores these two causes will be, to the extent that it successful, of questionable efficiency.

4.0 THE AMERICAN EXPERIMENT

The perceived problems with the Act, respecting implementation and compliance, highlighted above can be predicted by existing economic theory. The explanation of why individual decision makers may chose not to obey the law can be enhanced by examining jurisprudence and some of the other social sciences.

4.1 A Model of Implementation

4.1.1 The Theory Transaction Cost Politics

Thus the transaction costs paradigm differs from the neoclassical, and thus, the rationale for North's claim becomes self evident:

Rational choice models in politics have applied the basic assumptions of neoclassical economic theory to politics. Those assumptions include instrumental rationality and the notion (usually implicit) of efficient markets. I believe that the uncritical acceptance of both of these assumptions has led political theory astray. A transaction costs theory of politics is built on the assumptions of costly information, of subjective models on the part of the actors to explain their environment, and of imperfect enforcement of agreements. Choices employing such models result in high political transaction costs that make political markets very imperfect, I believe that modifying the standard rational choice model by incorporating into it transaction cost theory can substantially increase the explanatory power of the model and make more sense out of the political markets we observe. (North 1990 p.335 footnotes omitted)

North proceeds to examine what a rational choice model of the democratic political process might look like and advances the idea he has called transactions cost politics.

Transaction costs are the costs of measuring and enforcing agreements. In economies, what are measured are the valuable attributes of goods and services or the performance of agents; enforcement consists of the costs associated with realizing the terms of exchange. Measurement consists of the physical and property right dimensions to goods and services and the performance characteristics of agents. While measurement can frequently be costly, the physical dimensions have objective characteristics (size, weight, color, etc.) and the property rights dimensions are defined in legal terms. Competition plays a critical role in reducing enforcement costs. The judicial system provides coercive enforcement. Even so economic markets throughout history and in the present world are frequently very imperfect, beset by high transaction costs and defined by institutions that produce incentives that work against economic efficiency. Indeed, creating markets is the key issue to creating productive economies.

Political markets are far more prone to inefficiency. The reason is straight forward. It is extraordinarily difficult to measure what is being exchanged in political markets and in consequence to enforce agreements. (North p.362)

Dixit expands upon North's idea of transaction costs politics in a manner particularly relevant to the issues addressed in this paper. Dixit postulates that the relationship between citizen, legislator and bureaucratic regulator is a multi-task multi-principal agent relationship. As the name suggests Dixit puts forth a model in which an agent (agency) is charged with multiple tasks, say listing endangered species, protecting the habitat of listed species, and enforcing the Act. While carrying out these multiple tasks the agent is, at least in some sense, answerable to several potentially different principals, say Congress, the executive branch, the general public, various interest

groups, and perhaps even the press. Each of these potential principals may potentially have divergent if not contradictory goals.

In the easy case of a single principal, Dixit's approach is built upon the premise that the world is one that conforms to the transaction costs paradigm. This has two important consequences. First, the decision makers are boundedly rational and opportunistic. Second, information is imperfect, costly and asymmetrically distributed. This, of course, suggests that while any player can understand and optimize his or her *ex ante* position that this is not necessarily true of his or her *ex post* position. It further suggests that there may exist other players who not only have a better knowledge as to the *ex post* result of an *ex ante* decision by a particular player, but that they may, in fact, have the ability to affect the *ex post* position of the first player to that player's detriment and to their advantage. This is particularly the case if the players with the superior information have the ability to respond to the initiatives of the players with the inferior information. Dixit's model explicitly assumes that the tasks the agent faces at least partially compete for the agent's time and effort and that the priorities of the principal and the agent diverge. Dixit suggests, as possible sources for such divergence, that the parties have different concepts of the type of effort a task requires or that new tasks may have lower value to an existing agency in terms of its original mission (Dixit p.96).

The principal's problem then becomes arriving at an incentive structure that prompts the agent to behave in the manner desired by the principal. That is, the principal

must design a system of penalties and payoffs which make it in the agent's best interest to pursue the principal's desires.

The first question to address is: What is the nature of the incentives available?

Dixit observes:

Even in economic contexts, rewards or penalties may be financial or nonmonetary. The former category must be interpreted broadly to include career concerns, that is, future material rewards as well as the immediate payoff; similarly, a broad interpretation of nonmonetary incentives includes status, power, and job satisfaction. In political contexts the nonfinancial aspects are likely to be more important than in economics. Even with this understanding, however, it is commonly observed that incentives for policy makers are quite low powered; the marginal rewards for producing an outcome of greater value to society, or the marginal penalties for doing worse, are generally a very low percentage of the value added or lost. A bureaucrat in the Office of Management and Budget, or an international trade negotiator, can take actions that benefit or hurt the economy to the tune of billions of dollars, but the effect on his own compensation, monetary or otherwise, is at most a very tiny fraction of this. Much of the commonly held belief that political processes and institutions cope poorly with agency problems can be attributed to the low power of their incentives. (Dixit p.94-95)

Dixit then goes on to observe the choice of incentives schemes is going to be a function of how observable the different inputs and outputs of the system are, and of the difference in values. That is, the lesser the degree of informational asymmetry between the principal and the agent the easier the agent will be to control. In support of these observations Dixit offers the following example:

An example close to home will make the point clear, University professors have two tasks, teaching and research. The output of research is relatively easily measurable in terms of prestigious publication and citations; that of teaching is more nebulous because the real effects are

long term, and the students' evaluations have their own biases. If the university considered each task and its incentives in isolation, it would recognize the different precisions of information and set up a high-powered reward scheme for research and a low-powered one for teaching; but that would induce professors to divert effort away from teaching and into research. Therefore, considering the two together, the university is forced to reduce the power of its scheme for rewarding research.⁷[7. A better solution may be greater specialization among universities. Some can place more emphasis and reward on research, while others concentrate on teaching; then, each will attract the type of students who value its favored activity relatively more highly. In the context of politics, such specialization is not be[sic] feasible for national governments, although it may be for localities within a country.]

Now introduce a third activity, outside consulting, that is primarily of value to the professor rather than to the university. If the reward schemes for teaching *and* research are low-powered for the reasons explained above, the teachers will divert their effort into consulting. The university could cope with this by increasing the power of the incentives for teaching and research together, but that would be a costly alternative because teaching effort is not easily observable. . . . The university therefore instead prohibits consulting, or at least restricts the time allowed for it. Some consulting will be allowed if that makes it easier to ensure that the professor gets enough utility from the whole bundle of activities to be willing to work for the university, that is, to satisfy the professor's individual rationality (participation) constraint. But this calculation will involve comparing the average product of consulting time and marginal reward for teaching and research. A full social optimum would equate the marginal product of the two. This departure from the ideal is the unavoidable cost of the informational asymmetry in this case. (Dixit pp.96-97)

As an aside, it might be thought that firing is the ultimate high-power incentive. One need only consider Dixit's example above and consider how difficult it is to fire a tenured professor, to see that the power of firing as an incentive becomes suspect.

Now to aggravate an intractable problem, what happens if an agent faces multiple principals? If the principals have a common goal the problem remains essentially the same. Should the principal's goals be divergent, the agent would be expected to play one

principal off against the other. Unless, of course, one principal can punish the agent for doing another principal's bidding. In this case the principals have no incentive to offer the agent anything but low-power incentives, as high-power incentives, such as a monetary bribe, could be taxed from the agent by the other principal(Dixit p.99-100). This follows because the first principal is not likely to be prepared to enrich the other principal through the agent if he can buy off the other principal directly at a lower cost, since the agent will not be taking a cut. It is clear that if Dixit is correct that several things are going to be required before one will see anything but low-powered incentives. The tie between effort and results on the part of the agent are going to have to be known and the results are going to have to be relatively easily discernible, else the principal has no reason to offer the incentive. Why would any one pay for something they do not have to pay for, or why would they pay for something if they can not tell if it was delivered or not. The second requirement is that the other principal(s) not be readily able to ascertain the tie between the ultimate result and the original principal's high-powered incentive, or if they can perceive of the tie that they be unable to punish the agent. Thus, the theory, incidentally, provides a rationale for the prohibition on bribery, at least as far as it exists as an exploitation of informational asymmetry.

4.1.2 The Predictions

In a modern constitutional democracy such as the United States, or in Canada, it is clear that only, in the immediate pre-election period, are members of the electorate principals. It is equally clear that only those members of the bureaucracy engaged only in

policy implementation and enforcement, and in no way involved in policy formation, thus lower level bureaucrats, are agents and only agents, save when they act as principals in their guise as electors. It is also clear that it is not necessary to further exacerbate the problem by including the numerous permutations of potential principal agent relationships to see that the model predicts the rise of politicization within regulatory decision making. The low level bureaucrat may well be able to avoid the politicization, but the minute that one becomes a principal in one relationship and an agent in another, within the same structure, one it seems is, by definition, in a political environment. This becomes clear when you consider that the paradigm role reverser in the system is the elected official, who is also the ultimate political figure in the structure. The level of politicization is, of course, going to shift as you move up the bureaucratic ladder.

Scarcity of resources is, in some sense, a complaint that can be leveled against any rational choice model. If resources are sufficient to meet all competing ends then choice, whether rational or otherwise does not arise. That is, if resources are sufficient to accomplish everything why would everything not be accomplished? When, however, scarce resources are to be allocated by the state on public policy grounds, where there is even the least divergence in public opinion over the correct allocation of those resources, there will be those who feel that the allocation chosen was incorrect. Consider as an example the American budgetary process. Assume that Congress is an agent whose payoff is reelection and has one million dollars, which can go to protecting endangered species, or to the military, or it can be divided in some manner between protection and

the military, or that taxes can be raised to spend a million on each. Assume, further, that the general public, as principals, is divided into thirds, one-third in favor of all the money going for protection, one-third want all the money to go to the military, one-third does not want taxes raised. Next assume that the public will vote in accordance to their preference, if Congress complies with their desires they will vote for them, if not against them. Whatever Congress should choose to do at a minimum one-third of the electorate is going to be displeased with their allocation and not vote for them. Granted, this example abstracts from Dixit's transaction costs postulates, however the adage that you cannot please everyone will continue to hold, although less strongly once you allow the players in the game to cheat, steal and lie, and throw in detection problems.

Several implementation problems flow from, or are perhaps evidence of, bounded rationality. Imprecision can flow from at least two sources. The first is lack of knowledge. The second is the wish to afford a future opportunity for opportunistic behavior, to equivocate if you will. Both flow out of bounded rationality. Lack of information is by definition bounded rationality. With regard to opportunities for opportunistic behavior under all of Dixit's assumptions a legislator can choose at time A to support a particular piece of legislation phrased in a particular manner. At time B the credibility of that legislator's claim that the occurrence or the interpretation of the legislation that has angered some group or the other was not what he intended can only be enhanced the more imprecise the language adopted at time A. As informational asymmetry makes it difficult to assess the validity of the legislator's claim, imprecision

should be expected. An analogous argument can be made for the granting of discretion. Why take the blame if you can pass it on to someone else, particularly someone with greater technical knowledge than you possess.

The manner in which uncertainty is discounted and to a lesser extent the unit of protection, are also to be expected from bounded rationality. Beginning with units of protection, the agent legislator's claim will be that species by species, with the accompanying ecosystem for each species was, at the time, the best expert advice available. It will likely also be observed that since this is a current professional dispute, who is Congress to intervene. It must be recalled, that this is also, the result of a political process, and as such a compromise of sorts, which returns us to the notion of pleasing everyone. The method used to discount the future is a technical issue subject to highly technical professional disagreement. These sorts of debates become rooted in a lack of knowledge. The best way to determine who has the correct manner of discounting events over the next century is to wait a hundred years and see who comes closest. This is, unfortunately, not an available option when the decision must be made today. The determination of the sufficiency of habitat protection and the adequacy of the recovery planning process, also suffer from lack of knowledge. While there is general agreement that matters appear to be getting worse, just how much worse and what is the best method of correcting the situation appear to be questions over which reasonable, informed and sincere people have sincere and sometimes profound differences of opinion. Again, some

of these debates, particularly questions such as what is adequate or sufficient, have fallen and continue to fall into the political arena.

Undue attention to high profile species falls straight from Dixit's discussion of incentives. Politicians and bureaucrats alike are going to, if they are given a choice, dedicate their time and energy to those things that the citizens care the most about (Dixit p.96).

Finally, inadequate interagency consultation is a necessary corollary to Dixit's discussion of incentives. Boundedly rational opportunistic individuals will desire to hog the glory, sharing only the blame.

After **Tennessee Valley Authority v Hill** insufficient consideration of economic factors became certain, frankly it became mandated. This has become an implementation problem in two senses: first it affects compliance decisions, second it will further tend to politicize the system. Implementation of policy without regard to the economic well being of the citizens is going to cause problems. Given the politicization of the system that the model predicts, any senior bureaucrat in any democratic country is going to be hesitant to implement policy that adversely affects the well being of the voters to whom his or her political masters answer.

While the models addressed above deal effectively with Clark's view of most of the problems associated with implementation of the Act, they fail to address the problem of compliance. Compliance might be one of the least understood areas of study of human decision making. There has, however, been some work done in the area, a quick review of which is probably merited.

4.2 A Model of Compliance

4.2.1 The Theory

That the mere passing of legislation may not be sufficient to insure general compliance with that legislation may not be self evident. In the **Concept of Law**, H. L. A. Hart sets forth the notion of humans as internalists who obey the law essentially because it is the law, and externalists who obey the law, if they obey it at all, from fear of sanction, either from the community or by the law itself(Hart pp.86-88).

From Hart it becomes clear that if the external pressures are not severe enough the externalist may not obey the law. Gary Becker, as economists are wont to do, casts the question of compliance in terms of costs and benefits. Becker says:

The approach taken here follows the economists' usual analysis of choice and assumes that a person commits an offense if the expected utility to him exceeds the utility he could get by using his time and other resources at other activities. Some persons become "criminals," therefore, not because their basic motivation differs from that of other persons, but because their benefits and costs differ. (Becker p.9)

That is, Becker would have an individual faced with the choice of complying with or breaking the law, conduct a cost benefit analysis and act in accordance with the results of

that analysis. Specifically, the individual will calculate his expected utility from breaching the law, which is equal to the utility he expects to gain from acting illegally less the utility he must surrender in order to act illegally (i.e. what it actually cost him to perform the illegal act) less the expected utility lost due to detection and the consequent liability. The expected utility lost due to detection and liability is the probability of detection times the utility lost by being held liable, assuming that liability automatically follows detection. Thus, if the expected utility of breaking the law is positive one will break the law, if it is negative one will comply and if it is zero one will be indifferent between the two outcomes. This is, of course, the idea that underpins the theory of efficient breach in contract law. If the potential damage award one faces for breaching the contract is less than the potential losses one will face by performing the contract one will breach the contract. If however, the award exceeds the losses one will perform.

Unfortunately, the world is only this simple a place if the costs and the benefits are properly accounted for. There exists some work, both theoretical and empirical that suggest that there may be some gain to an individual to act in a socially responsible manner. Arrow has observed:

Thus there are two types of situation in which the simple rule of maximizing profits is socially inefficient: the case in which costs are not paid for, as in pollution, and the case in which the seller has considerably more knowledge about his product than the buyer. (Arrow p.309)

The two cases have come to be known in the economic literature as externalities and information asymmetry. Arrow then goes on to conclude that should firms or individuals act in a socially responsible manner and thus not maximize profits or utility, by not taking

advantage of their superior knowledge or limiting their pollution discharges, there is a net gain which can be distributed throughout society. Arrow does not suggest that this sort of action will arise out of altruism. In fact, he says:

Now I've said that ethical codes are desirable. It does not follow that they will come about. An ethical code is useful only if it is widely accepted. Its implications for specific behavior must be moderately clear, and above all it must be clearly perceived that the acceptance of these ethical obligations by everybody does involve mutual gain. (Arrow p.315)

Should such a code be generally honored there is an advantage to any one firm to cheat.

As Arrow observes:

The code may be of value to the running of the system as a whole, it may be of value to all firms if all firms maintain it, and yet it will be to the advantage of any one firm to cheat - in fact the more so, the more other firms are sticking to it. (Arrow p.315)

The question then becomes why, or more specifically under what conditions, will a firm not cheat. From game theory it can be shown that in an infinitely repeated game where the other player(s) have the ability to punish the cheater that the cooperative (non-cheating) equilibrium prevails (Varian pp.270-271, Friedman pp.156-157). Thus, reputation, if you will, matters, at least in theory. In questions of compliance with the law, this suggests that it may be in one's long run best interest to forego a short run gain obtainable through non-compliance and comply with the law in order to preserve reputation. Therefore, when the decision to comply is made these sorts of long run costs should be included in the cost benefit accounting.

Kahneman, Knetsch and Thaler empirically examined the question of punishment of cheating and found that 68% of their urban Canadian sample would incur the

additional expense of five minutes travel time to avoid dealing with a pharmacy that took advantage of temporary market power, and that 69% of their sample would incur the same cost to avoid a pharmacy they believed was discriminating against its elderly employees (Kahneman, Knetsch and Thaler p.736). In the same study they also concluded that there exists some form of community standard as to what is unfair behavior for retailers in price setting and in their dealings with their employees. They note that such standards are likely to vary in specifics across communities (Kahneman, Knetsch and Thaler p. 737).

Community standards of fairness could be expected to affect the cost benefit analysis to determine the question of compliance with law. If the law is perceived in the community to be unfair it is conceivable that the reputational effects of breaking that law will be lessened. It is conceivable that those effects could be as low a zero, or, perhaps, even positive. Being convicted for the illegal processing of salt does not appear to have harmed Gandhi's reputation, and, in fact, appears to have enhanced it.

While not dealing with fairness, per se, Tom Tyler, did a study, in Chicago, in which he found statistically significant correlation between perceptions of the legitimacy of authority and compliance with it. That is, authority that was perceived to be legitimate was more likely to be complied with than authority that was not perceived as legitimate. From this study Tyler conclude that normative values are more important in compliance questions than was previously believed (Tyler p.178). It would seem that perceptions of

fairness would be one of those normative values which Tyler avers matter, in questions of compliance.

4.2.2 The Prediction

So what does that lead one to expect about compliance with the **Endangered Species Act, 1973**? It seems unlikely that the community of landowners forced by the public to bear the costs of protecting endangered species as they are under the Act would view the Act fair. Species are listed without any reference to the economic consequences of their listing. Once they are listed the presence of the species brings forth the various protections available under the Act to the species, this includes the protection of habitat and the ban on taking, even on private land. Thus, the presence of a listed species on private land constrains the uses that the owner of the land may make of the land. All other things being equal this will deflate the price of the land; given two identical pieces of property, one with constrained uses one with unconstrained uses, which will a buyer pay more for all other things being equal? Unless the purchaser gains utility from the species and the act of protecting it the answer is clearly the land with the unconstrained use. In addition it is conceivable that the presence of a listed species will alter the management systems available for use on the property, requiring more costly management. Consider the case of Wilton, New York where the presence of a listed butterfly required that the city's mosquito control program adopt a more expensive chemical to avoid killing the butterflies (Mann and Plummer p.103). In effect the Act

imposes an externality, free riders, upon landowners that have a listed species on their property. These landowners are in fact bearing the cost of protecting the listed species for the general public. This is, in fact, the mirror image of an industrial externality where the few force the many to bear the cost. Given that the "not in my backyard" opposition to any particular development tends to base its arguments in terms of the unfairness to them of being saddled with the externality would it be surprising that owners of property on which a listed species resides would believe themselves treated unfairly?

If in the landowning communities, the Act is perceived as unfair, the decision not to comply is not likely to be affected by fairness or reputational concerns. Thus, it would seem that the decision to comply is going to be based on the simple cost benefit analysis proposed by Becker. The rational land owner is going to estimate the decrease of the market value of the land, the additional management costs, if any, the cost of any property damage that the listed species may inflict, that is things like stock or stored grain losses; these costs would then be summed and discounted for the length of time that the owner intended to hold the land. The expected utility of breaking the law, in monetary terms, would be the net present value of these avoided costs, less the actual cost measured in monetary terms of breaking the law. The actual costs of breaking the law would include cash costs such as bullets or poison and the time cost. The cost of detection would be the probability of detection times the cost of the penalty as set out in section 11 of the Act. Should one be incarcerated the cost will be the opportunity cost of sitting in prison. In the event that one is an employee that would amount, at a minimum,

to foregone wages, if one is self employed it would, at a minimum, be the cost of hiring replacement labor. There may also be some incidental costs such as difficulty in obtaining visas and government permits and perhaps even subsequent employment. These costs would also be discounted.

The probability of detection will drive the compliance decision. It is potentially very low, particularly in the rural United States. This can be hypothesized as the expected case, because detection is a function of monitoring. Listed species are by definition rare, consequently in order to monitor for their protection you have to know where to find them. If one is dealing with members of the species that are unknown to the authorities, it seems highly unlikely that they would know where to look. Secondly, monitoring is expensive, it requires that the regulator have employees out in the heartland, employees have to be paid and the heartland is vast area where strangers are readily identified and the population may not be hospitable, thus potentially requiring large numbers of employees to insure effective monitoring. If one is in the center of a 100 square mile western Montana ranch the odds that there is anyone within 5 miles of you may well be pretty low. The chances that that person would work for the Fish and Wildlife Service may well approach insignificant. Given the foregoing, economic theory suggests that the rational landowner faced with the presence of a listed species has a large incentive to shoot, shovel and shut up.

As with the complaints leveled against the Act with respect to implementation the theory expounded above explains why the compliance complaints leveled at the Act might be expected. The question that must now be faced, as was pointed out earlier, is the fitness of the Act as a model for the Bill, given the admittedly different institutional structures in Canada and the United States.

5.0 THE POLICY ANALYST'S PROBLEM

How can a policy analyst rationally analyze policy that has no track record to facilitate the examination of the effects of the policy? Neo-classical welfare economics essentially rates policies based on the amount of distortion between the neo-classical perfectly competitive equilibrium and the equilibrium achieved with the policy in place that achieves the policy goal. The tool used to rate the policy is the total available sum of consumer and producer surplus. That is, the area above the supply curve, below the demand curve and to the left of the equilibrium. The preferred policy is that one that has the greatest total surplus, while achieving what it was meant to do at the lowest possible cost. Thus, the preferred policy will be that policy that equates the marginal social benefit of habitat to its marginal social cost.

This requires that a policy, to bear consideration, achieve its objectives. When dealing with policy that has yet to be implemented the determination of whether or not the policy will achieve its objective can pose a considerable challenge. This challenge might be overcome, if a policy has been implemented elsewhere. This allows for an examination of the policy, as implemented elsewhere, to ascertain its strengths and weaknesses. The strengths and weaknesses can then be modeled. Proposed policies can then be examined to ascertain whether or not they have the theoretical ability to take advantage of the modeled strengths and address the modeled weaknesses in the policy

implemented elsewhere. Utilizing such a methodology requires that the analyst be constantly vigilant in recognizing and accounting for the differences between where the implemented policy was implemented and where the proposed policy is to be examined. This caution is equally necessary when moving between problems within a polity, as it is when looking at cross political jurisdiction solutions to identical problems, as will be proposed here. The implemented policy, to be used as a model, shall be the United States **Endangered Species Act, 1973**. It will, of course, always have to be recalled that the Act is American legislation that is somewhat different than the Bill, and is intended to operate under a different constitutional structure than the Bill.

6.0 THE ACT AS A MODEL FOR THE BILL

That the United States and Canada have different institutional structures is undeniable. The two countries have fundamentally different forms of government. The United States is a federal republic. Canada is a federal constitutional monarchy. The question that a policy analyst must address is the determination of whether or not there are sufficient similarities between these different constitutional arrangements to expect similar responses from similar policies.

Both forms of government are essentially representative democracies. Both forms of government claim to proceed from England's Glorious Revolution of 1688, and to be based upon the liberal principals of the Enlightenment used to justify the Glorious Revolution. This has come to mean that both forms of government are founded on several key principals. These include, the Rule of Law, private property, that the citizen has rights that are unassailable by the state, and eventually, the adoption of universal adult suffrage.

The similarities do not end with the fact that both forms of government find their origins in what is essentially liberal political theory. Both Canada and the United States have relatively rigid written constitutions. Although, given its current amending formula, Canada's is likely the more rigid. Both of these written constitutions contain

constitutional protection of the citizen from the state. The American Constitution has, of course, the **Bill of Rights**, while Canada's has the **Charter of Rights and Freedoms**. Both documents protect essentially the activities on the parts of the citizens, except for the inclusion of property in the **Bill of Rights**. The absence of a not withstanding clause, and the introductory limitation of rights which imposes limits on rights that are "prescribed by law and reasonably and demonstrably justified in a free and democratic society", suggest that individual liberty was and continues to be taken more seriously by Americans than Canadians. Countries also share a similar legal system, one based largely on English Common Law, but both of which have been influenced by European Law, because of the presence of former non-English colonies within the borders of the current nation states. These legal systems hold the courts as the final arbitrators of inter citizen disputes, of all constitutional questions, both those that relate to the division of constitutional powers between the two levels of government within the respective federations and between the citizens and the state with regards to the states ability to infringe upon the citizens' liberty, and finally with the courts' supervisory role over inferior tribunals based upon the prerogative writs under English Law, often referred to as Administrative Law. It bears notice that the American Courts generally have friendlier public interest standing rules than we have in Canada. In as far as standing with respect to endangered species protection is concerned the Bill by section 60 essentially grants public interest standing. These similarities seem to suggest differences between the two forms of government are more matters of form than principle from the perspective of a decision maker facing existing policy.

With a majority government, in Canada, relying on party discipline the clearest example of the difference in form between the two governments is where power to regulate rests. In Canada at both the federal and provincial levels of government power lies in cabinet. In the United States it is split between the legislative and the executive branches, again at both the national and the state level. In both countries the courts have supervisory roles, but can only act on the complaint that regulation is, for whatever reason, *ultra vires*, that is beyond the power of the government that made it. Thus when enacting endangered species protection legislation the differences in form, while they can be of extreme importance in other areas such as who can do what and who do special interest lobby or how do they have to structure their law suits to get something done, do not appear to present any compelling reason to reject the Act as a model for the Bill. Once the policy is in place a decision maker in either country faces ultimate enforcement of the policy through markedly similar judicial systems.

That there are also differences in the latitudes of the courts to favor the citizen over the state is equally clear. These differences render no more a compelling reason to reject the Act as a model for the Bill than does the difference in form. The American Constitution, as was observed earlier, protects private property, which the Canadian Constitution does not. The American Constitution also places greater limits on the state in its relations with an individual than the Canadian Constitution does. Given the acceptance of the Act by the United States Supreme Court in **Tennessee Valley**

Authority v. Hill (98 S.C.R. 2279 (1978)), it would seem that there remains no reason, except perhaps division of powers questions, to expect the Canadian courts to reject a piece of legislation similar to the Act. That is, if the level of interference with individual property and liberty that the Act affords the American government is acceptable in the United States there is no reason to suppose that similar legislation should offend individual liberty in Canada with its more restrictive protections of individual liberty, provided of course that the Government of Canada has the authority under the division of powers to enact the legislation. Given the dicta of the Supreme Court of Canada in **R. v Hydro Quebec** ([1977] 3SCR 213), the division of powers question also becomes moot. In this decision both the majority and the dissent agreed that the criminal law power under s. 92 (27) of the **Constitution Act, 1867** was broad enough to allow the federal government to enumerate and legislate against crimes against the environment. Thus, so long as the offence as created by Parliament requires *mens rea*, an intentionally guilty mind, the federal government has the constitutional authority to pass it. That is, so long as you can only be convicted for meaning or intending to do what you did, it is valid criminal law and within the authority of the federal government. As the Bill only purports to regulate actions, on private property in the provinces of Canada, only if the illegal action is "willfully" or "knowingly engaged" in, the Bill seems unassailably within the constitutional authority of the Government of Canada.

The Bill uses a listed species criterion similar to the Act. The Bill mandates that if a species, which is defined to include subspecies, is on the best biological evidence, as

determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Bill s. 13), in danger of extinction or extirpation that the species will be listed. The Bill allows for five classifications in listing, based upon the level of risk that the species face, these include: extinct, extirpated, endangered, threatened or vulnerable. Once listed the species receive the protections enumerated under the Bill. These protections include protection from killing, harming and harassing, it is an offence under the Bill to possess a listed species or any of its body parts, and finally its habitat is protected, if that habitat is located on federally owned or regulated land (s. 31-32), and on private land under the appropriate circumstances (s. 33). Much of the publicly expressed concern over the Bill tends to arise out of its potential applicability to private property. The Bill only affects private property, by section 33 of the Bill, if the residence of a cross international boundary migratory species, or a species whose range crosses an international boundary is located on private property. The listed species is protected under this scheme but the only habitat protected is the residence of the listed species. The debate about the applicability of the Bill to private property seems to be centered on how broadly the word "residence" is likely to be interpreted by the courts, and how wide a latitude the courts will be prepared to grant under section 33 of the Bill, for a species to be defined as migratory and thus subjecting private property to the Bill. Should these terms be defined broadly enough they will impose a substantial externality upon private landowners in the same manner that the Act imposes an externality on private landowners in the United States.

Section 33 of the Bill reads:

33. The Minister may make regulations prohibiting any person from
- (a) willfully killing, harming, harassing, capturing or taking an individual of a wildlife animal species, other than one mentioned in paragraph 3(1)(a) or (b), if COSEWIC
 - (i) has determined that the species migrates across an international boundary of Canada or has a range extending across such a boundary, and
 - (ii) has designated the species as an endangered or threatened species, or
 - (b) knowingly engaging in activities that damage or destroy the residence of the individual

Before making the regulations, the Minister must consult the provincial minister of each province in which the regulation will apply.

On the face of section 33 it is clear that the majority of animal species at risk in Saskatchewan, such as whooping cranes, swift foxes, burrowing owls and black footed ferrets (if there are in fact any left in the province) fall within one of the two parameters of migratory, either they cross the border with the United States or their range extends across the border. Consequently, it will depend upon the interpretation of residence to determine how private land in Saskatchewan will be affected by the Bill.

The Bill's statutory dictionary defines residence as:

"residence" means a specific dwelling place, such as a den, nest or other similar area habitually occupied by an individual during all or part of its life cycle.

If the courts should interpret residence as anything broader than the actual physical place where the listed species actually lives, be that a hole in the ground or a nest in a tree for

example, the potential for imposing an externality on private landowners increases.

While an interpretation of such breadth may appear to strain the meaning of the definition, the argument in support of a broader interpretation would be that Parliament must clearly have intended that the individual member of the listed species have a sufficient amount of protected space to insure its survival, as opposed to its mere actual physical home. The whole scheme of the Bill is to protect listed species. Thus, it can be argued that it is nonsensical to suppose that Parliament would protect the beast's burrow while allowing it to starve to death. Whether or not the Courts ultimately adopt this interpretation may be a moot point. If private landowners are boundedly rational, opportunistic decision makers the mere fact that the argument can be made *ex ante* to any judicial decision may be sufficient to prompt those landowners to act to avoid the risk of bearing the externality. That is, if landowners credibly believe that their land could be affected by the Bill, should a listed species be present, they can be expected to do what they can to avoid having the externality associated with the listed species fall upon them. This is particularly the case since the landowners have vast knowledge superiority over the regulators when it comes to knowing what is or is not living on their land. This would suggest that there is a good chance that the Bill establishes incentives perverse to its stated objectives much as the Act has. That is to say that there seems to be little reason to reject the Act as a model for the Bill.

6.1 Hypothesis that the Theory Suggests

If the foregoing is correct there are several things that we should expect to be able to see at the present and several things that we can hypothesize as being critical to ascertain the course of future events.

Dixit's model suggests that attempted solutions to the problem will become mired in political debates. That this has occurred and continues to occur is self-evident. The nature of the debate also flows quite readily out of Dixit. The debate does not revolve around the policy goal itself, the protection of endangered species, but rather centers on how the goal is to be defined, achieved and on the allocation of the costs of achieving the goal. That the debate has taken such a tone also adds credence to the hypothesis that the underlying problem is one of free riders and thus property rights definition. The previously noted recent increase in pasture acreage suggests that there may be some merit in the observations made above respecting the recent abandonment of grain and oil seed production subsidies.

The foregoing also suggests several testable hypotheses that can lead to further hypothesis respecting the likelihood of compliance with prohibitive legislation generally and the Bill specifically. As was noted above attitudes related to the social and cash costs of conviction and the likelihood of conviction all go into the mix in making the decision

whether or not to comply with a particular piece of legislation. Specifically, following Becker the higher the benefits of non-compliance, the lower the social and cash cost of non-compliance properly discounted by the probability of detection the less likely compliance. Thus if these attitudes can be ascertained for a group such as land use decision makers it becomes possible to arrive at a hypothesis respecting the likelihood of the groups compliance, this hypothesis can then be compared to the hypothesis of noncompliance inherent in the choice of the Act as a model for the Bill. These, of course, suggest hypotheses about these attitudes. Specifically, if the theory is correct and if the Act is a valid model for the Bill, the attitudes expressed should be a low perceived social cost accompanied by perceptions of relatively low probabilities of detection. It is also likely that individuals in the test group would view the proposed legislation as unfair, and would expect their neighbors to disregard it. The hypothesis averred above, that the Sask. Act is likely to be perceived as less intrusive than the Bill, can also be tested.

7.0 THE SURVEY

The survey used a technique whereby the respondents were asked to select their preference from a list of options contained in the questionnaire as opposed to a revealed preference disclosure technique. While the literature clearly shows that a revealed preference questionnaire is less likely to be biased than the technique used the nature of the information sought for this study made the use of revealed preference techniques impractical. A copy of the survey questionnaire is attached as appendix A.

Questions one through fifteen and twenty-six and twenty-seven are designed to acquire basic demographic and operation size data. Questions sixteen through twenty-three are meant to test the hypothesis that the abandonment of the **Western Grain Transportation Act** will lead to changes in the manner in which operations are structured that will ultimately lead to improved habitat. Questions twenty-eight to thirty-one and thirty-five to thirty-eight are used to elicit beliefs respecting the present existence of endangered species upon the landscape. Questions thirty-one and thirty-two, thirty-nine and forty, and forty-five through forty-eight are meant to test perceptions of social cost of unlawful behavior. Question thirty-four test attitudes respecting fairness. Questions forty-one through forty-four inquire into perceptions of the probability of detection, as indirectly do questions forty-nine to fifty-one, which also query perceptions of governmental commitment to endangered species protection. Questions fifty-two

through fifty-five examine the extent of a conservation ethic among participants, while questions fifty-six and fifty-seven ask participants to report their risk attitudes. Finally, questions fifty-eight through sixty-two are essentially contingent valuation questions meant to explore the respondents valuation of the opportunity cost of additional habitat.

The questionnaire was mailed to four hundred members of the Saskatchewan Stock Growers Association. The four hundred were chosen by draw without replacement from the membership list provided by the Association. Prior to the draw, the corporate, government and academic membership were removed, leaving a pool of seven hundred and eleven members, which were numbered from one through seven hundred and eleven. From the numbers the draw was held. A list of the numbers drawn is attached as appendix B. Of the 400 questionnaires mailed 90 responses were received, while the question within those 90 responses that had the lowest response rate, garnered 63 responses.

7.1 Survey Results

Of the 90 respondents, 87 claimed to be the operation's principal decision maker; while 83 reported to be male 3 respondents failed to respond to this question and four reported being female. The vast majority of the respondents, some 80 people reported residing on their own operation. The distribution of the respondents by reported age is shown in table 7.1.1.

Table 7.1.1 The Distribution of Respondents by Age

	AGE GROUPS						
	>75	64-74	55-64	45-54	35-44	25-34	<25
# Respondents		5	15	14	28	22	5
Source: Survey							2

As is clear from table 1, there is a skewed distribution age wise of the respondents. This is consistent with other data that show an aging agricultural population in Saskatchewan.

Thirty respondents indicated that they raise stock other than cattle. Sixty-two of the respondents reported doing some backgrounding, 29 reported some finishing, and 3 reported some milking, with all of them milking fewer than 20 cows. Respondents tended to be from larger operations, with 41 of the respondents reporting operations of two hundred or more breeding head. The distribution of respondents by reported size of breeding herd is shown in table 7.1.2.

Table 7.1.2 The Distribution of Respondents by Size of Breeding Herd

	# Breeding head						
	<20	20-49	50-99	100-149	150-199	200-250	>250
# respondents		4	6	16	15	9	17
Source: Survey							24

Twenty-four respondents use PFRA community pastures. Government of Saskatchewan community pastures use was reported by 18 of the respondents.

Respondents were asked to use a 1 to 5 scale, where 1 was strongly disagree, 3 was indifference and 5 was strongly agree, to express their level of agreement to statements respecting the presence of endangered species, the fairness of expecting land owners to bear the cost of protecting endangered species, the likelihood of the Bill, if

passed, to affect their land. They were asked to use the same scale to address statements respecting perceptions of social cost of noncompliance, about their beliefs respecting how concerned government actually is, how they perceived the probability of conviction, the likelihood of their neighbors complying and about how they think about the presence of endangered species.

The respondents weakly denied the presence of endangered species on land owned or rented by their operation, responding with a mean assessment of 2.8, however the T-statistic, for the hypothesis that this mean was significantly different from 3, was 1.2. Similarly the mean response of 3.2 to the statement averring the possible presence of endangered species on land owned or rented by the respondents' neighbor was not statistically significantly different from 3. The statement "I feel that it is manifestly unfair to expect landowners to bear the cost of protecting endangered species" had a mean of 4.3 and was strongly significant. With means of 4.3 the statements suggesting that if passed the Bill will affect the respondents or the respondents neighbors land was also strongly significant.

The statements respecting perceived social costs were intermixed throughout the questionnaire, and all were structured such that indifference (3) agreement (4) or strong agreement (5) is indicative of a perception of respectively lower social costs associated with noncompliance with the Bill, should it become law. For example a mean response indicating indifference to or agreement with the statement: "I would invite a convicted

poacher to my or my child's wedding" is taken to indicate that in general society does not hold the illegal killing of animals in contempt, and thus will not shun a poacher or impose any other significant social costs on a poacher. . Incidentally this statement was the only one of the social cost question that had a mean less than 3. However, with a T statistic of 1.16 the hypothesis that the mean of 2.8 is different than 3 cannot be rejected neither can the hypothesis that the 3.02 mean accompanying the statement " I would accept an invitation to the wedding of a convicted poacher" is different from 3 be rejected, as the T statistic associated with the hypothesis was 0.15. The avowal, that if the respondents' neighbors feel it to be in their best interest not to obey the Bill that the neighbors will not comply, had a statistically significant mean of 3.8. When asked to aver that they would socialize with a neighbor convicted of breaching the Bill should it become law the mean response was, a statistically significantly different from 3, 4. When asked to avow a preference between socializing with a neighbor convicted of breaching the Bill or a urban relative, a rural relative not a member of the respondent's district and a rural relative resident in the respondents district, who objects to the presence of the felon the means were 3.4, 3.5 and 3.4 respectively, all of which were statistically significantly different from 3 at a 95% confidence level. Similar results were reported for the Saskatchewan Wildlife Act and its endangered species protection provisions.

The respondents on average express some statistically significant distrust of government commitment to the preservation of endangered species. When asked whether they disbelieved that either the Government of Canada or the Government of

Saskatchewan was particularly interested in the preservation of endangered species or if either level of government was prepared to commit anything beyond minimal resources to endangered species preservation the respondents gave statistically significant means of 3.4 and 3.8 respectively. The respondents did, however, exhibit a fairly strong conservation stance. When asked if they liked to watch wildlife on their land the mean was over 4, as it was when asked about liking to watch wildlife on their neighbors land. They also gave significantly greater than 3 responses on average when asked if they wanted to see more wildlife if they did not have to pay for it, mean of 3.7. However, they expressed on average indifference to seeing more wildlife when it was not qualified by the ability to escape the associated costs.

The respondents tended to exhibit a belief that the probability of detection was quite high. The average response to the statement that there was a one in a thousand chance of conviction was not different significantly different from three at the ninety percent level. The same is true to the responses for a chance of conviction of greater than one in a thousand. The statistically significantly different from three responses were for one in five chance of conviction with a mean of 3.4 and one in a hundred with a mean of 3.3. These results seem contrary to the respondents claimed distrust respecting the seriousness of government's commitment to endangered species protection and may be the result of lack of experience on the part of the respondents with enforcement branches of government. The anecdotal evidence from the United States suggests that enforcement is a problem and that the probability of successful detection is really quite low. Given

Canada's larger land mass and markedly smaller population than the United States it seems unlikely that the probability of conviction will be higher here than it is in the United States.

7.2 Regression Results

The representativeness of these attitudinal results was tested by regressing, using ordinary least squares and White's correction for heteroskedasticity, each of the vectors of responses to the attitudinal questions as a dependent variable against a matrix of demographic dependent variables. The demographic variables were age, sex, residence, size of breeding herd, amount of pasture owned and rented and the amount of cropland owned and rented. Fits were atrocious, which is to be expected if demographics has little to do with the attitudes. The R squareds for the regressions ranged from a low of 0.04 to a high 0.18.

As well as heteroskedasticity the data exhibited symptoms of multicollinearity. Principally, the dropping of an observation led to changes in the estimated coefficients of up to 50%. Combining the rented and owned pasture variables and rented and owned cropland variables into two single variables cropland and pasture eliminated some of this change. Eliminating any variables with T statistics of less than one essentially stabilized the coefficients of any statistically significant variables. This led to nine equations with statistically significant independent variables at a 90% or greater level of confidence.

The dependent variables for the regressions with statistically significant independent variables were: invite and attend, which is the vector of responses to the query respecting inviting a poacher to a wedding or attending a poachers wedding respectively; fair, which is the vector of responses to the question respecting the belief in the fairness of expecting landowners to pay for protecting endangered species; felon over family member of your district and felon over rural family member, which are the responses to the questions that aver a preference to socializing with a neighbor convicted of breaching the Bill or the Saskatchewan Wildlife Act over a family member who lives in a rural area or a family member who lives in the same rural area as the respondent who refuses to socialize with the neighbor purely because of the conviction; government cares, which is the vector of the responses to the assertion: "I do not believe that either the Government of Canada or the Government of Saskatchewan is particularly committed to the protection of endangered species"; and E1IN5, E1IN1000 and GR1IN1000, which are the responses to the avowal that the probability of detection is one in five, one in one thousand or greater than one in one thousand respectively. The independent variables were: c, the intercept; age, the age of the respondents; sex, the gender of the respondents; res, how large a population center that the residence of the respondents is located in; herd, the size of the respondents breeding herd; crp, the amount of crop land that the respondents' operations own and rent; and pas, the amount of pasture that the respondents' operations own and rent. The F-statistic is the statistic to test the joint hypothesis that the coefficients of the independent variables a statistically significantly different from zero. While the column headed t-statistic is the statistic to test the

hypothesis that the coefficient of each of the independent variables is statistically significantly different from zero. The results for the least squares (LS) regression on dependent variables invite and attend are reported in table 7.2.1, the remaining six regressions are reported in appendix C.

Table 7.2.1 Regression Results For Invite and Attend as Dependent Variables

LS // Dependent Variable is INVITE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.280668	0.543646	4.195131	0.0001
RES	-0.3075	0.129881	-2.36753	0.0205
HERD	0.100286	0.083391	1.202608	0.2329
CRP	0.047024	0.043879	1.071687	0.2873
PAS	0.032514	0.028088	1.15757	0.2507
R-squared	0.118724	F-statistic		2.559658

LS // Dependent Variable is ATTEND

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.422664	0.511125	4.739871	0
RES	-0.37729	0.096297	-3.91802	0.0002
CRP	0.036888	0.043935	0.8396	0.4038
PAS	0.036778	0.028324	1.298486	0.198
HERD	0.120875	0.083166	1.453419	0.1502
R-squared	0.15735	F-statistic		3.547907

Source: Survey

The signs of the significant variables suggest that the larger the community you live in the less likely you are to invite a poacher to a wedding or to attend a poachers wedding. That the larger your breeding herd or the more pasture you own and rent the more likely you are to attend a poacher's wedding and the less likely you are to believe that the probability of conviction is one in five. That the older you are the more likely you are to believe that it is not manifestly unfair to expect landowners to bear addition costs for habitat protection. That females are more likely than males to prefer to socialize

with family members than neighbors who have been convicted of violating the Bill, if the family member objects to the neighbor. That the larger your breeding herd the more likely you are to believe the government is serious about endangered species protection. The larger the community in which you live the less likely you are to think that the probability of detection is one in five and the more likely you are to believe that it is one in a thousand or greater.

7.3 Implications of the Survey and Regression Results

The low R squareds of the regressions and the small number of statistically significant coefficients suggest that the attitudes found in the survey are fairly generally held across the respondents. Given the mean responses to the attitudinal questions it seems that the social costs of breaching the Bill, should it become law, are not sufficiently high to guarantee that a rational economic agent, who personally gains little or no utility from the presence of endangered species, will comply. As the penalty structure under the Bill is similar to that under the Act, and as has been argued above there is little reason to expect any greater rates of conviction in Canada than in the United States it seems clear that the compliance problems associated with the Act are to be expected in Canada should the Bill become law.

If the Bill can be expected to suffer from compliance problems similar to those that afflict the Act, this, of course, suggests that the Bill by itself will not prove

particularly successful at addressing endangered species protection problems in the heavily human inhabited regions of Canada. If as this work suggests there is good reason to believe that the prohibitive policy framework inherent in the Bill is not likely to prove successful in addressing the endangered species problem the obvious question becomes what will address the problem.

If the endangered species problem is underscored by a free rider driven under investment in habitat as has been argued above then the use of a stick that can be avoided by means fair or foul cannot be expected to cure the problem. As this work suggests that the Bill, should it become law, is likely to be avoided by unlawful means one of the corollaries that must arise is that successfully solving the endangered species problem is going to require some form of augmentation of the Bill, again should it become law.

The need for augmentation suggests that the Bill be joined to policies that either inflict unavoidable costs on activities that exacerbate the endangered species problem or that allow decision makers to capture some of the public good benefits associated with investment in habitat. Colloquially, if you are going to use a stick make sure the decision maker cannot avoid it and if you cannot find an unavoidable stick use a carrot. Ultimately if Canada is going to successfully resolve its endangered species problem such cross compliance measures may prove a key component in the successful policy package.

8.0 IMPLEMENTED POLICIES THAT MAY AFFECT ENDANGERED SPECIES HABITAT

If the Act is a valid model for the Bill, and if the Act is truly the disaster it is represented as here, then is there anything policy makers can do or have done to avoid the problems associated with the Act? In neoclassical economic theory, the principal reason to regulate is, of course, market failure. In the case of endangered species, that would be an attempt to deal with the free rider problem. This seems to suggest that policy that is going to deal effectively with free riding is going to accomplish one of two things. It will either render the agents to be free ridden upon incapable of resisting the free riders or it will render it impossible or at least more difficult for agents to free ride. That is the policy can employ a carrot or a small stick, as opposed to the big stick of prohibitive policy.

Those policies which render the agents to be free ridden upon incapable of resisting the free riders, small sticks, basically remove benefits from or impose costs on agents who act as perfect competitors. That is you remove benefits from or impose costs upon agents who lack market power and thus have no means of passing them on, and if properly structured have no means legal or illegal of avoiding them. The agents are then forced by the market to make land use decisions, in theory, based upon the highest use value of the land. This aids habitat in the agricultural region of Saskatchewan by moving marginal crop land out of grains and oil seed production into the production of forage or

use as pasture, both of which are presumably better habitat than fence row to fence row cultivation.

As far as the removal of benefits goes, we have seen some of that already occurring in the agricultural region of Saskatchewan. For various reasons, all of which are beyond the scope of this examination, both the Federal Government and the Saskatchewan Provincial Government have largely abandoned subsidizing agricultural production generally and grain and oilseed production specifically. This has had the corollary, although probably anticipated, effect of lowering the expected return from grain and oilseed production relative to other uses for less fertile land. The abandonment of the Gross Revenue Insurance Plan and the Crow Benefit for grain transportation have had the effect of rendering grain and oilseed production, particularly production of grain and oilseeds for export, on marginal land uneconomic. The abandonment of GRIP lowered revenues and the abandonment of the Crow Benefit raised costs, both of which lower net returns to cropland. One of the most likely results of these changes, over time, will be an increase in pastureland. This will provide better habitat than grain and oilseed production does. The full effects of these changes should be expected to occur over a number of years, although improved pasture acreage has increased in Saskatchewan from 2,658,002 acres in 1991 to 3,047,567 acres in 1996 (Saskatchewan Agriculture and Food Agricultural Statistics 1996). Thus, the abandonment of subsidies tied to grain and oilseed production has the effect of altering the highest use value for marginal land away from grain and oilseed production toward better habitat.

The survey tested the hypothesis that the abandonment of the WGTA transportation subsidy moved land use away from cropping into better habitat forms. Forty-nine respondents reported changing their operations composition in the last five years. There were twenty reports of change in the size of the cattle herd because of the elimination of the WGTA transportation subsidy; with nineteen reports of increased herd size. Seventeen reports of changes in owned pasture with sixteen increases, six changes in pasture rental with five respondents reporting increases. Eighteen respondents reported changes in owned forage as a result of the repeal of the subsidy with sixteen of the reports being increases. Two respondents reported changes in leased forage, both of which were increases. Fifteen respondents changed their owned cropland as a result of the repeal, twelve of them decreasing their holdings. All three of the respondents who claimed changes in leased cropland as a result of the repeal of the WGTA transportation subsidy claimed decreases. The response to whether or not the operation had changed in the last five years was regressed as the dependent variable against the same demographic data that was regressed against the attitudinal data reported above. The statistically significant results are reported in table 8.0.1. These results suggest that the older you are the less likely you were to have made any changes and the more cropland you have the more likely you were to change.

Table 8.0.1 Regression Results for Change in Operation in the Last Five Years as the Dependent Variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.862622	0.159673	5.402426	0
AGE	-0.11377	0.030846	-3.68815	0.0004
CRP	0.037769	0.015734	2.400483	0.0186
R-squared	0.169526	F-statistic		8.675572

Source: Survey

In a similar vein the move to limit moral hazard under the crop insurance program should, at least in theory, move marginal land out of the production of grains and oilseeds and into something friendlier as wildlife habitat. Moral hazard is the action on the part of an insured that alters the risk the insurer faces after the contract is entered into, for example speeding in an automobile, or sowing land that you would not of sown but for the policy. Insuring on the basis of an individual producer's average yields rather than area average yields should lower the incentive to seed marginal land. If your only going to be covered for what you have historically actually grown rather than on the basis of what has actually been grown in the area, your incentive to seed marginal land should decline, thus increasing the amount of land for which the highest use value is not grain or oilseed production. Before drawing any real conclusions respecting crop insurance two things bear notice. First, the idea that individual averages will dissuade moral hazard requires that decision makers once they move marginal cropland to another use they will leave it in that use. Given the improvements in agricultural chemicals it is distinctly

possible that should crop insurance offer contracts with guaranteed output prices sufficiently above expected market prices decision makers may have an incentive to spray, break and seed the marginal land. The extent to which this will pose a problem depends entirely on how accurately expected prices are reflected in the crop insurance contracts. That is, the closer the Saskatchewan-Canada Crop Insurance Corporation can come to actual expected prices when writing their policies the less likely moral hazard is to arise and the less distortionary crop insurance will be. Second, crop insurance with its subsidized premiums remains a subsidy that has the ability to make using land for cropping appear economic to an individual decision-maker, when but for the subsidy it would not be. However, given the attempts to limit moral hazard in the system, crop insurance is probably not now as distortionary as it was.

As well as the small sticks, we have also seen recent examples of carrots being used to improve habitat. Saskatchewan has established conservation easement under the **Conservation Easement Act**(R.S.S. 1978 c. 27.01). The basic concept is extremely simple. You as a landowner grant an easement over some portion of your land that has some particular conservation characteristic, in the instant case something that forms good species habitat, to a qualifying agency, some organization like Ducks Unlimited Canada, or the Nature Conservancy of Canada. You get a tax break; the agency gets to file an easement against your certificate of title at the appropriate land titles office. Once the easement is filed the land, which you retain title to, can only be dealt with subject to the easement. That is to say that the land stays in its habitat form until such time as the

agency agrees otherwise. While the presence of the easement may affect the salability of the land, lower its sale price to a third party, the tax break you receive plus any utility you receive from the presence of the habitat should in theory compensate you for any decrease in price. It bears notice that not all the easements that you might enter into need cause a decrease in the value of the property. For example you might fence off a stream through a pasture and grant the easement on the stream, it is conceivable that a purchaser might pay the same price for such a pasture as he would of without the easement. You will of course, however, have to pay the capital and maintenance costs for the fence. These cost; particularly the capital costs may however be offset by an organization such as Ducks Unlimited Canada.

The Government of Saskatchewan is also a participant in the North American Waterfowl Management Plan. The plan is largely administered, in Saskatchewan, by Ducks Unlimited Canada (DU). Under the plan DU has established various programs ranging from the outright purchase of land through long term leases and funding farmer/rancher capital expenditures in exchange for easements and contractual undertakings for things like delayed forage harvest and rotational grazing, to establish marshes and prairie upland habitat for waterfowl nesting. As a corollary benefit the same prairie upland habitat that is suitable waterfowl nesting is suitable for other upland species. While the Gray, Rosaasen and Taylor study suggests that the plan has overall been reasonably successful (Gray et. al. 1992) it is not without some potential problems. Contracts whether for lease or for sale must be negotiated separately. This will have the effect of increasing

transactions costs. The potential for hold up problems also exists. Should a project require dealing with several land owners, each owning key pieces of property with specific physical attributes once one agreement is reached and the money invested the other land owners can be expected to raise their prices to extract additional rents. The purchaser being aware of this phenomenon may elect not to enter into negotiations at all rather than find him or she held up after the expenditure of the time and money necessary to enter negotiations. Finally, the limitation on land ownership found in the **Saskatchewan Farm Security Act** (R.S.S. 1978 c. S-17.1), and the constraints on subdividing a quarter section of land in the **Planning and Development Act** (R.S.S. 1978 c. P-13.1.) impose administrative and other transactions costs which may result in land being leased which should be purchased.

The Province of Saskatchewan has also recently legislated in this area, passing what has the potential to become fairly big stick. Two pieces of legislation have passed Saskatchewan's legislature and received royal assent. **The Wildlife Act, 1997** (R.S.S. 1978 c. W-13.11) and **The Wildlife Act, 1998** (R.S.S. 1978 c. W-13.12) which while it received Royal Assent remains unproclaimed (collectively hereinafter referred to as The Sask. Act as the statutes are identical in their treatment of endangered species). The Sask. Act like the Bill and the Act uses a listing procedure. The Sask. Act does not however immediately confer protection on the listed species habitat, but rather arrives at habitat protection through section 50, which allows for the formation of recovery plans.

Subsection 50(5), which sets out the factors that the minister, may consider in a recovery plan reads:

50(5) the factors that the minister may take into consideration when determining the priority to be assigned to a recovery plan or any portion of a recovery plan include:

- (a) whether scientific evidence indicates that the wild species at risk mentioned in the recovery plan is naturally becoming extirpated;
- (b) whether it is technically or economically feasible to recover the wild species at risk; and
- (c) the status of the wild species at risk elsewhere.

Thus, the Sask. Act has the potential to avoid some of the worst problems perceived to plague the Act and potentially the Bill. Under the Sask. Act if a species is doomed, its mere listing will not be sufficient to require that costs be born to attempt the impossible. If a species is at risk of extirpation in Saskatchewan, but is thriving elsewhere, the Sask. Act does not mandate that costs necessarily be born to protect the species in Saskatchewan. Thus, if private landowners are to face an externality for the protection of listed species under the Sask. Act it is relatively clear that the instances of such an externality occurring should be rarer under the Sask. Act than under the Act or the Bill, and should be related to species with generally better chances of recovery than can be expected under either the Act or the Bill. The Sask. Act, in section 52, also has an exception to the protection granted a listed species which allows the director to license the removal, death, capture or destruction of an endangered species if it is necessary to do so to protect human health or to prevent property loss. If Mann and Plumber are correct that it is impossible to save all species, then the course taken in the Sask. Act may well be wiser than that adopted by the Bill or the Act.

It bears notice that should the Bill be reintroduced and passed in its present form, and should the Sask. Act be proclaimed, that should an actual conflict arise between the operation of the two statutes that under the paramouncy doctrine the federal law will prevail. That is to say, that if the federal government acting constitutionally under the criminal law power and the provincial government acting constitutionally under their property and civil rights powers enact legislation which is contradictory by the doctrine of paramouncy the federal legislation rules. Given the wording of the two statutes the only actual conflict that seems likely to arise is a listing of a species under the Bill when that species is not listed under the Sask. Act. Should such an event occur the species would be listed and entitled to the protection of the Bill.

9.0 COSTS OF PRESERVING HABITAT

The Bruentland Commission in **Our Common Future**, its report calls for 12% of all land, both public and private, to be conserved. In the agricultural region of Saskatchewan that would constitute approximately eight million acres being 12% of the just over 66 million acres reported by Statistics Canada from the 1991 Census of Agriculture. Conrad Olson of Saskatchewan Environment and Resource Management (SERM) suggests that between six and seven million acres of habitat exist in the agricultural region of the Saskatchewan. This imprecision has two sources. First, there is no general agreement as to exactly what constitutes habitat. Second, these lands are often divided between different programs such as the representative areas network, the conservation easement program, Ducks on Limited lands or Saskatchewan Provincial Parks for example. This Mr. Olson explains makes it difficult to determine exact acreage as land can be and in fact is counted under different programs at the same time. About one-fifth of these lands remain in a natural (pre European contact state) while the remainder has in some sense been developed. Essentially this suggests that in order for the Province of Saskatchewan to attain the 12% suggested by Bruentland in the agricultural region of the province that an additional one to two million acres will be needed (Olson, telephone conversation of July 7, 1999). The costs of converting and/or preserving this land are going to have to be born by someone. For example should the Bill be successful, unlike as has been argued above, the costs will largely be born by

landowners. Should government elect to purchase or lease any necessary private land while converting crown land the cost can be largely expected to be born by taxpayers. Should the task fall to private groups like Ducks Unlimited the costs will fall on the groups' members.

Given the public good nature of habitat and the apparent technical limits on excluding anyone from its pollution abatement benefits valuing habitat becomes difficult. It is trite economics that when a resource is optimally used the benefit of its use at the margin equals the cost of its use. In a perfectly competitive market, such as the market for land in the agricultural region of Saskatchewan appears it is easily shown that at the optimum the use to which a resource is put must generate benefits at the margin equal to or greater than the opportunity cost associated with the next best use. To convert land from agricultural use to habitat, the next best use would appear to be agricultural, and thus if the land is to be converted to habitat it must return at least what it would in its agricultural use. This implicitly assumes that the benefits from habitat exceed those from agricultural use. For this to be true the benefits that free riders gain from habitat must be greater than any additional costs land owners are forced to bear plus the value of lost production. If humanity is indeed faced with an endangered species crisis driven by habitat loss then the assumption would appear to be true.

Humanity's understanding of the exact nature and extent of the benefits that free riders accrue from additional habitat is nebulous at best. If as was averred above the

market for agricultural land, in the agricultural region of Saskatchewan, is perfectly competitive and if agriculture is the next best use of the land after habitat then the current price of agricultural land should represent the opportunity cost that the benefits of habitat must equal or exceed at the margin. That is, if landowners can earn the same or greater return from land used as habitat as they can for land used for agriculture, they will use it for habitat. Thus, in economic theory the optimal amount of habitat will be that amount of habitat such that the benefits earned from the last unit of habitat would be equal to what could be earned had that last unit been used for agriculture instead. The question then becomes one of what constitutes the mix of types of land necessary to form the 12% the Bruentland Commission specifies.

Theory suggests that at the margin for optimal land use to be achieved land should be used for its highest value purpose. Gray, Burden and Dehaan draw a distinction between land's physical margin and its economic margin. Their basic findings suggest that because of other production risks economically marginal land can differ from physically marginal land (Gray et. al. 1994). This implies that if habitat is drawn from land that at the margin is uneconomical for agriculture that a mix of different soil types is still possible. This, of course suggests that if habitat is drawn only from least economic portions of the agricultural land base that it should still be distributed through out the agricultural region of the province. Thus, it would seem reasonable to convert the least economically viable agricultural land to habitat. This suggests that the costs of habitat

can be calculated by examining the economic viability of any particular piece of land, choosing those that will be cheapest.

Something similar to this was done in **The Economic and Sociological Evaluation of Land Use Options, Saskatchewan Implementation Plan of The North American Waterfowl Management Plan** (Gray, Rosassen and Taylor et. al. 1992). In this work Gray, Rosaasen and Taylor et. al. compare the cash rent, paid by DU under the Prairie Care lease of uplands for nesting for waterfowl, to what the farmer could expect to earn, as the landlord under a one-third to the landlord crop share lease. They do this by creating representative farm budgets. They commence with a soil class G budget, the most prevalent soil classification in the area (Quill Lakes region of Saskatchewan), and adjust it for the other soil classes by prorating the G budget by the ratio of expected yields of the enterprise in soil class 'X' divided by the expected yields of the enterprise in soil class 'G'. Income is calculated by taking the area average yields for each soil classification multiplied by GRIP prices over a rotation that represents the then ten year average rotation in the area. The rotation is expressed as a ratio of the enterprise, seeding wheat, barley, canola or summerfallowing, acreage, by soil classification, to the total acreage in the area by soil classification (see table 1 in the appendix D). With this model they concluded that the cash leases paid by DU were roughly comparable to what the farmer could expect, for a return to land, were he to farm the land himself or lease it to another farmer on a one-third to the landlord crop share lease, rather than lease it to DU as nesting habitat. Using this procedure the found that under the prairie CARE leases that

DU was paying farmers a return which was roughly equivalent to what they could earn as landlords under a one-third to the landlord crop share (See table 13 in Appendix D).

This result was generated by adding to income what Gray, Rosaasen and Taylor call an inventory adjustment. They credit the budget they use as coming from Top Management Workshop data. In a footnote to the budget they call the miscellaneous income line of the budget an inventory adjustment (Gray, Rosaasen, Taylor et. al. 1992), in the lexicon of the Top Management Workshop miscellaneous income includes things like straw and subsidies, this suggests that they may have double counted the GRIP subsidy. In any event, within a cash accounting world, such as Canadian agriculture, this adjustment is difficult to justify. It would seem more likely that farmers would be more interested in specific annual earnings from their various enterprises in a given year, rather than some form of accrued income earnings. Particularly, when comparing those earnings to an annual cash lease payment. Correcting for this, but otherwise following the same procedure, yields substantial rents to the representative farm, generated by leasing property to DU (see Appendix D table 10). These rents range from a high of seven dollars and ninety cents, to a low of five dollars and forty cents, depending upon soil classification. These rents become even larger ranging from fifteen dollars and seventy-two cents to eight dollars and thirty-four cents, if one utilizes the estimates of 1992 farmgate prices for the three commodities that Gray, Rosaasen and Taylor provide (see table 12 in Appendix D). As is clear from tables 10 and 12, the prairie CARE lease payments provide returns to land far in excess of the one-third crop share lease.

One further observation is in order, regarding the comparison between the crop share and the Prairie CARE leases. It is readily apparent from tables 10 and 12 that as land quality falls the premium extracted by entering a Prairie Care lease, at least in percentage terms, increases. That is, DU is paying relatively more money for relatively poorer farming land. At first this may appear counter intuitive. It, however, may well be the case that what is poorer farming land may be ideal waterfowl producing land. Land that is covered in potholes with saline soil which is marginal for crop production could be ideal for DU's purposes, provided that they can establish the grass cover and habitat that they desire. The reason that DU could expect to pay proportionally higher rents to attract this land, than an observer would expect the producers to be most interested in not farming, may well lie in the ability of the farmers to realize the particular suitability of this land to DU's purposes. As producer seem aware of the premium that DU is apparently prepared to pay for this more marginal crop producing land they have been able to extract proportionally higher rents from DU for this more marginal land. This is a typical result from holdup problems.

It is interesting to note that even with rents as large as shown in tables 10 and 12, that some of the participants in the program expressed, when surveyed by Gray, Rosaasen and Taylor, the opinion that the compensation was inadequate. Economic theory, of course, suggests that such an attitude must be irrational, given that these producers

voluntarily entered the program. Of those surveyed producers, who were not in the program, a significantly smaller percentage expressed the opinion that the compensation was inadequate (Gray, Rosaasen, Taylor, et. al. 1992). It is submitted that if the dissatisfaction expressed is anything other than an attempt to improve the farmers negotiating position, in the hope of extracting even more substantial rents when these contracts are renegotiated, the disgruntled producers must be viewing the payment as compensation for the negative externalities associated with waterfowl as well as returns to land.

While it is possible that the participating farmers view the lease payment as, at least partially, compensation for the negative externalities associated with having large numbers of wild waterfowl, it must be remembered that this can only be partial. The Waterfowl Crop Damage Compensation Program, administered by the Saskatchewan Crop Insurance Corporation, will pay for seventy percent of the damage inflicted by waterfowl at the then current crop insurance price for that commodity (<http://www.gov.sk.ca/agfood/scic/addprog.htm> of 29 MAR 97). Thus, any compensatory value, that the farmers perceive themselves as receiving, must be for the thirty percent of the loss not covered by the Waterfowl Crop Damage Compensation Program, or for some other externality such as a perceived increase in the risk of fire due to the abundance of dry grass that the nesting cover programs tend to cause in an area. Finally, there is, at least, one other potential thing that farmers might view themselves as

being compensated for. This is, of course, the costs associated with reverting the land leased to DU to crop production land at the expiration of the lease³.

In another attempt to ascertain the likely costs associated with habitat protection as part of the survey respondents were asked to indicate the amount of their operations land base that they would be prepared to return to habitat for property tax relief and annual cash payments of ten, twenty, thirty and forty dollars per acre. Respondents were given the choice of zero, five, ten, twenty or fifty per cent of the land base, or they could elect other and specify a percentage not listed. The median responses was zero for every option except the forty dollar payment where one more respondent elected the other category over zero with a median response of one hundred per cent in the other category. This methodology shares the typical problems associated with contingent valuation, that is the respondents have very little incentive to tell the truth. This is clearly evident from the responses received. Forty dollars per acre per year represents a cash lease that most landlords would unquestionable accept for good productive crop land, yet twenty-six per cent of the respondents claimed that they would not cede any of their operations' land base for such a payment, never mind any of their best land. Thus, based on Gray's Rosaasen's and Taylor's work it seems likely that an annual payment in the neighborhood of twenty dollars per acre should attract the one to two million acres that it

³ We are indebted to Dick Schoney who raised this issue with us in a discussion that we had while we were working on this paper. In the same conversation Dr. Schoney also pointed out that as the lease payments under this program are cash payments that a certainty equivalent to the crop share may be a more appropriate comparison then the crop share, however he also conceded that the length of the lease is such

appears are necessary to get to the eight million acres of land that the Brunteland Commission suggests. This of course suggests that the total costs to be born by someone to arrive at a level of habitat that allows sustainable human existence in the agricultural portion of Saskatchewan will be some twenty to forty million dollars per year.

that a certainty equivalent would need to be adjusted for the risk inherent in the length of the contract and to do so, with any accuracy, is a problem that the discipline needs to further address.

10.0 CONCLUSIONS

The results of our survey indicate that should the Bill in fact become law in its present form that there is good reason to believe that it will not prove effective in protecting endangered species and their habitats even given the relatively pro conservation stance we found among Saskatchewan cattle producers. This is a result of the fact that the costs that the Bill is likely to impose on the owners of private land will exceed the benefits to those same landowners. The costs imposed by the Bill can of course be avoided by landowners by the simple expedient of not complying with the Bill. Our survey further suggests that the social costs of not complying are insignificant. As our analysis finds no significant differences between Canada and the United States in respect to the enforcement of laws we cannot expect that Canadians will react any differently towards the Bill than Americans have reacted towards the very similar **Endangered Species Act, 1973**, and thus compliance problems with the Bill appear a foregone conclusion.

As the Bill is not likely to be successful, as it fails to address the free rider problem in any meaningful way, the question of whether or not prohibitive policy has any place in what is essentially a land use problem arises. Coupled with some other policy, such as the American Conservation Reserve Program the prohibiting of killing endangered species may prove more palatable to the land owning community. As long as there is some incentive that the land owning community can capture to go along with

habitat restoration and protection it will doubtless become more inclined to engage in such activity. Should this incentive be tied to the presence of endangered species it will, of course, be in the land owning communities best interest to insure that endangered species are present, and thus the social costs associated with noncompliance with legislation like the Bill will rise. Similarly the probability of detection should also rise, if land owners need endangered species present to access some tax payer funded program it is in their best interest to report individuals who breach prohibitions on the killing of endangered species.

The work of Gray, Rosaasan and Taylor et. al. suggests that a policy that pays landowners in the neighborhood of twenty dollars per acre per year should be sufficient to advance the habitat protection and restoration goal. This would also suggest that should the Bill become law and be effectively implemented, which we believe to be unlikely, that landowners, should they remain uncompensated, will face costs of the same magnitude.

There is a considerable amount of work that remains to be done in this area before a many more definitive conclusions can be drawn. In order to determine if optimal levels of habitat are being achieved requires a far superior understanding of the relationships between ecosystems and the manner in which they abate industrial pollutants. It will also be necessary to achieve a far greater understanding of the internal functions of ecosystems to ascertain those species whose extinction will have the least impact on

humanity. In other words humanity has to determine more precisely that level of natural capital stock that cannot be replaced by man made capital. If these relationships and levels can be accurately determined then the benefits that society in general receives from the natural environment can be accurately determined, the costs of achieving those benefits can be compared to the benefits and optimal levels determined.

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APPENDIX A: THE SURVEY

1. Are you one of the operation's principal decision maker(s)?
☐ yes ☐ no
2. Sex
☐ male ☐ female
3. Are you:
☐ 75 years of age or greater
☐ 65 to 74 years of age
☐ 55 to 64 years of age
☐ 45 to 54 years of age
☐ 35 to 44 years of age
☐ 25 to 34 years of age
☐ 24 years of age or less
4. Do you live
☐ on your operation
☐ population center of less than 1000 people
☐ population center of 1000 to 5000 people
☐ population center of 5000 to 10000 people
☐ population center of 10000 to 20000 people
☐ population center of greater than 20000 people
5. Does your operation raise any livestock other than cattle?
☐ yes ☐ no
If yes, please specify the type of animals
6. How many head of breeding stock are in your operation's cattle herd?
☐ less than 20 head
☐ 20 to 49 head
☐ 50 to 99 head
☐ 100 to 149 head
☐ 150 to 199 head
☐ 200 to 250 head
☐ more than 250 head

7. Does your operation background any cattle?

☐ yes ☐ no

if yes, how many per year?

☐ less than 20 head

☐ 20 to 49 head

☐ 50 to 99 head

☐ 100 to 149 head

☐ 150 to 199 head

☐ 200 to 250 head

☐ more than 250 head

8. Does your operation finish any cattle?

☐ yes ☐ no

if yes, how many per year?

☐ less than 20 head

☐ 20 to 49 head

☐ 50 to 99 head

☐ 100 to 149 head

☐ 150 to 199 head

☐ 200 to 250 head

☐ more than 250 head

9. Does your operation milk any cows?

☐ yes ☐ no

if yes, how many head of breeding stock?

☐ less than 20 head

☐ 20 to 49 head

☐ 50 to 99 head

☐ 100 to 149 head

☐ 150 to 199 head

☐ 200 to 250 head

☐ more than 250 head

10. How many acres of **pasture** does your operation own?

☐ none

☐ less than 160 acres

☐ 160 to 320 acres

☐ 320 to 640 acres

☐ 640 to 1280 acres

☐ 1280 to 1920 acres

☐ 1920 to 2560 acres

☐ more than 2560 acres

11. How many acres of **pasture** does your operation **rent**?

- ☐ none
- ☐ less than 160 acres
- ☐ 160 to 320 acres
- ☐ 320 to 640 acres
- ☐ 640 to 1280 acres
- ☐ 1280 to 1920 acres
- ☐ 1920 to 2560 acres
- ☐ more than 2560 acres

12. How many acres of **forage** does your operation **own**?

- ☐ none
- ☐ less than 160 acres
- ☐ 160 to 320 acres
- ☐ 320 to 640 acres
- ☐ 640 to 1280 acres
- ☐ 1280 to 1920 acres
- ☐ 1920 to 2560 acres
- ☐ more than 2560 acres

13. How many acres of **forage** does your operation **rent**?

- ☐ none
- ☐ less than 160 acres
- ☐ 160 to 320 acres
- ☐ 320 to 640 acres
- ☐ 640 to 1280 acres
- ☐ 1280 to 1920 acres
- ☐ 1920 to 2560 acres
- ☐ more than 2560 acres

14. How many acres of **cropland** does your operation **own**?

- ☐ none
- ☐ less than 160 acres
- ☐ 160 to 320 acres
- ☐ 320 to 640 acres
- ☐ 640 to 1280 acres
- ☐ 1280 to 1920 acres
- ☐ 1920 to 2560 acres
- ☐ more than 2560 acres

15. How many acres of **cropland** does your operation rent?

- ☐ none
- ☐ less than 160 acres
- ☐ 160 to 320 acres
- ☐ 320 to 640 acres
- ☐ 640 to 1280 acres
- ☐ 1280 to 1920 acres
- ☐ 1920 to 2560 acres
- ☐ more than 2560 acres

16. Did you change the size of your operation's cattle herd or land base in the last five years?

☐ yes ☐ no; if no go to question 24.

17. Did your operation change the size of your its cattle herd **because** of the elimination of the WGTA grain transportation subsidy?

☐ yes ☐ no

if yes, by how many head of breeding stock?

- ☐ less than 20 head
- ☐ 20 to 49 head
- ☐ 50 to 99 head
- ☐ 100 to 149 head
- ☐ 150 to 199 head
- ☐ 200 to 250 head
- ☐ more than 250 head

Was the change an ☐ increase or ☐ decrease?

18. Did your operation change its **owned pasture** acreage **because** of the elimination of the WGTA grain transportation subsidy?

☐ yes ☐ no

if yes, by how many acres?

- ☐ less than 160 acres
- ☐ 160 to 320 acres
- ☐ 320 to 640 acres
- ☐ 640 to 1280 acres
- ☐ 1280 to 1920 acres
- ☐ 1920 to 2560 acres
- ☐ more than 2560 acres

Was the change an ☐ increase or ☐ decrease?

19. Did your operation change its **leased pasture** acreage **because** of the elimination of the WGTA grain transportation subsidy?

___ yes ___ no

if yes, by how many acres?

___ less than 160 acres

___ 160 to 320 acres

___ 320 to 640 acres

___ 640 to 1280 acres

___ 1280 to 1920 acres

___ 1920 to 2560 acres

___ more than 2560 acres

Was the change an ___ increase or ___ decrease?

20. Did your operation change its **owned forage** crop acreage **because** of the elimination of the WGTA grain transportation subsidy?

___ yes ___ no

if yes, by how many acres?

___ less than 160 acres

___ 160 to 320 acres

___ 320 to 640 acres

___ 640 to 1280 acres

___ 1280 to 1920 acres

___ 1920 to 2560 acres

___ more than 2560 acres

Was the change an ___ increase or ___ decrease?

21. Did your operation change its **leased forage** crop acreage **because** of the elimination of the WGTA grain transportation subsidy?

___ yes ___ no

if yes, by how many acres?

___ less than 160 acres

___ 160 to 320 acres

___ 320 to 640 acres

___ 640 to 1280 acres

___ 1280 to 1920 acres

___ 1920 to 2560 acres

___ more than 2560 acres

Was the change an ___ increase or ___ decrease?

22. Did your operation change its **owned cropland** acreage because of the elimination of the WGTA grain transportation subsidy?

____ yes ____ no

if yes, by how many acres?

____ less than 160 acres

____ 160 to 320 acres

____ 320 to 640 acres

____ 640 to 1280 acres

____ 1280 to 1920 acres

____ 1920 to 2560 acres

____ more than 2560 acres

Was the change an ____ increase or ____ decrease?

23. Did your operation change **leased cropland** acreage because of the elimination of the WGTA grain transportation subsidy?

____ yes ____ no

if yes, by how many acres?

____ less than 160 acres

____ 160 to 320 acres

____ 320 to 640 acres

____ 640 to 1280 acres

____ 1280 to 1920 acres

____ 1920 to 2560 acres

____ more than 2560 acres

Was the change an ____ increase or ____ decrease?

24. How much does a mile of three strand barbed wire fence cost to construct? \$_____

25. Do you insure currently through Canada Saskatchewan Crop Insurance?

____ yes ____ no, if no and you have previously carried Crop Insurance what was the last year you insured? 19____

26. Does your operation pasture any of its herd on PFRA community pastures?

____ yes ____ no

27. Does your operation pasture any of its herd on Government of Saskatchewan community pastures? ____ yes ____ no

For questions 28 to 57 please use the following scale to indicate the extent to which you agree with the sentiment expressed by the question.

Strongly Disagree	Moderately Disagree	Indifferent	Moderately Agree	Strongly Agree
1	2	3	4	5

28. I know that one or more endangered species are present on land that my operation owns or rents.

Please record a number between 1 and 5 based upon the above scale. ____

29. I know that one or more endangered species is present on land that one or more of my neighbors own or rent.

Please record a number between 1 and 5 based upon the above scale. ____

30. I believe that one or more endangered species could be present on land that my operation owns or rents.

Please record a number between 1 and 5 based upon the above scale. ____

31. I believe that one or more endangered species could be present on land that one or more of my neighbors own or rent.

Please record a number between 1 and 5 based upon the above scale. ____

32. I would invite a convicted poacher to my or my child's wedding.

Please record a number between 1 and 5 based upon the above scale. ____

33. I would accept an invitation to the wedding of a convicted poacher.

Please record a number between 1 and 5 based upon the above scale. ____

34. I feel that it is manifestly unfair to expect landowners to bear the costs of protecting endangered species.

Please record a number between 1 and 5 based upon the above scale. ____

For the remaining questions the words "Bill C-65" will be used to represent Bill C-65 which was titled the **Canada Endangered Species Protection Act**. In any reference to Bill C-65 in the remaining questions I will ask you to assume that Bill C-65 will be reintroduced and passed as it existed when Parliament was prorogued for the last federal election. That is, pretend that the new law the Federal Government is talking about passing will be the same as the last one they tried to pass. Similarly, any reference to the **Saskatchewan Wildlife Act**, should be taken as the endangered species provisions of the current **Saskatchewan Wildlife Act**, or the new **Saskatchewan Wildlife Act**, should it be proclaimed as they are the same in respect to endangered species protection. Please recall that it is the opinion of the Canadian Cattlemen's Association that Bill C-65 could protect habitat on private property, while such protection is not mandated by the **Wildlife Act**.

35. I feel that Bill C-65 will affect land that my operation owns or rents should an endangered species be present on the land.
Please record a number between 1 and 5 based upon the above scale. ____
36. I feel that Bill C-65 will affect land that my neighbors own or rent should an endangered species be present on the land.
Please record a number between 1 and 5 based upon the above scale. ____
37. I feel that the Saskatchewan **Wildlife Act** is less likely to affect land that my operation owns or rents then the Bill C-65.
Please record a number between 1 and 5 based upon the above scale. ____
38. I feel that the Saskatchewan **Wildlife Act** is less likely to affect land that my neighbors own or rent then Bill C-65.
Please record a number between 1 and 5 based upon the above scale. ____
39. I feel that should my neighbors believe it to be in their best interest not to obey Bill C-65 they will not obey it.
Please record a number between 1 and 5 based upon the above scale. ____
40. I feel that should my neighbors believe it to be in their best interest not to obey the Saskatchewan **Wildlife Act** they will not obey it.
Please record a number between 1 and 5 based upon the above scale. ____

Please only respond with one (1) strongly agree or moderately agree for questions 41 through 45.

41. I feel that if a person were to violate the provisions of either Bill C-65 or the Saskatchewan **Wildlife Act** that there is a 1 in 5 chance or greater that they would be convicted.
Please record a number between 1 and 5 based upon the above scale. ____
42. I feel that if a person were to violate the provisions of either Bill C-65 or the Saskatchewan **Wildlife Act** that there is a 1 in 100 chance that they would be convicted.
Please record a number between 1 and 5 based upon the above scale. ____
43. I feel that if a person were to violate the provisions of either Bill C-65 or the Saskatchewan **Wildlife Act** that there is a 1 in 1000 chance that they would be convicted.
Please record a number between 1 and 5 based upon the above scale. ____
44. I feel that if a person were to violate the provisions of either Bill C-65 or the Saskatchewan **Wildlife Act** that there is a less than 1 in 1000 chance that they would be convicted.
Please record a number between 1 and 5 based upon the above scale. ____

45. I would socialize with a neighbor convicted of violating either Bill C-65 or the Saskatchewan **Wildlife Act**.
Please record a number between 1 and 5 based upon the above scale. _____
46. I would prefer to socialize with a neighbor convicted of violating either Bill C-65 or the Saskatchewan **Wildlife Act** over a member of my family who is an urban resident who objects to socializing with my neighbor because of the conviction.
Please record a number between 1 and 5 based upon the above scale. _____
47. I would prefer to socialize with a neighbor convicted of violating either Bill C-65 or the Saskatchewan **Wildlife Act** over a member of my family who is a rural resident, not of my district, who objects to socializing with my neighbor because of the conviction.
Please record a number between 1 and 5 based upon the above scale. _____
48. I would prefer to socialize with a neighbor convicted of violating either Bill C-65 or the Saskatchewan **Wildlife Act** over a member of my family who is a rural resident, of my district, who objects to socializing with our neighbor solely because of the conviction.
Please record a number between 1 and 5 based upon the above scale. _____
49. I do not believe that either the Government of Canada or the Government of Saskatchewan is particularly committed to the protection of endangered species.
Please record a number between 1 and 5 based upon the above scale. _____
50. I do not believe that either the Government of Canada or the Government of Saskatchewan will commit anything beyond minimal resources to the protection of endangered species.
Please record a number between 1 and 5 based upon the above scale. _____
51. I feel that the government employees charged with enforcing either Bill C-65 or the Saskatchewan **Wildlife Act** will go to ridiculous extremes in the performance of their jobs by using dictated rather than cooperative means to settle any disputes that may arise.
Please record a number between 1 and 5 based upon the above scale. _____
52. I like to watch wildlife on land that my operation owns or rents.
Please record a number between 1 and 5 based upon the above scale. _____
53. I like to watch wildlife on land that my neighbors own or rent.
Please record a number between 1 and 5 based upon the above scale. _____
54. I would prefer to see more wildlife on land owned or rented by my operation.
Please record a number between 1 and 5 based upon the above scale. _____
55. I would prefer to see more wildlife on land that my operation owns or rents only if my operation is not solely responsible for the costs associated with the additional wildlife.
Please record a number between 1 and 5 based upon the above scale. _____

56. I am risk adverse that is I do not like to take risks.
Please record a number between 1 and 5 based upon the above scale. _____

57. I am risk neutral that is I am willing to trade risk for reward.
Please record a number between 1 and 5 based upon the above scale. _____

58. For a property tax waiver my operation would be prepared to let
_____ none of my operation's land base
_____ worst five percent of my operation's land base
_____ worst ten percent of my operation's land base
_____ worst twenty percent of my operation's land base
_____ worst fifty percent of my operation's land base
_____ other, please specify in percentage of your operation's land base _____ %
return to wildlife habitat.

59. For an annual cash payment of \$10.00 per acre my operation would be prepared to let:
_____ none of my operation's land base
_____ worst five percent of my operation's land base
_____ worst ten percent of my operation's land base
_____ worst twenty percent of my operation's land base
_____ worst fifty percent of my operation's land base
_____ other, please specify in percentage of your operation's land base _____ %
return to wildlife habitat.

60. For an annual cash payment of \$20.00 per acre my operation would be prepared to let
_____ none of my operation's land base
_____ worst five percent of my operation's land base
_____ worst ten percent of my operation's land base
_____ worst twenty percent of my operation's land base
_____ worst fifty percent of my operation's land base
_____ other, please specify in percentage of your operation's land base _____ %
return to wildlife habitat.

61. For an annual cash payment of \$30.00 per acre my operation would be prepared to let

- ☐ none of my operation's land base
- ☐ worst five percent of my operation's land base
- ☐ worst ten percent of my operation's land base
- ☐ worst twenty percent of my operation's land base
- ☐ worst fifty percent of my operation's land base
- ☐ other, please specify in percentage of your operation's land base ____%
return to wildlife habitat.

62. For an annual cash payment of \$40.00 per acre my operation would be prepared to let

- ☐ none of my operation's land base
- ☐ worst five percent of my operation's land base
- ☐ worst ten percent of my operation's land base
- ☐ worst twenty percent of my operation's land base
- ☐ worst fifty percent of my operation's land base
- ☐ other, please specify in percentage of your operation's land base ____%
return to wildlife habitat.

COMMENTS

PLEASE RECORD ANY ADDITIONAL COMMENTS HERE DO NOT HESITATE
TO ADD AN ADDITIONAL SHEET IF YOU FEEL THE NEED.

THANK YOU

63. I would like a copy of the survey results mailed to me.

____yes ____no

if yes please print you name and address in the space provided below.

Name: _____

Address: _____

64. I would agree to be interviewed to expand on the information contained in this survey. ____yes ____no

if yes please print you name address and telephone number in the space provided below.

Name: _____

Address: _____

Or as above _____

Telephone: (306) ____ - ____

**PLEASE NOTE THAT THIS PAGE WILL BE REMOVED AND FILED SEPERATLY
PRIOR TO THE ENCODING OF THE DATA CONTAINED IN THIS SURVEY.**

**SHOULD YOU NOT DESIRE A COPY OF THE RESULTS OR TO BE INTERVIEWED
PLEASE DO NOT HESITATE TO REMOVE THIS PAGE**

APPENDIX B: RESPONDENT LOTTERY RESULTS

3	95	183	273	359	457	533	623	695
4	97	185	274	360	458	534	624	697
6	98	186	276	361	459	535	625	699
10	100	188	277	362	461	537	628	703
11	103	190	278	363	462	538	629	704
14	104	192	279	364	463	539	633	708
16	108	196	281	366	464	540	634	710
17	109	197	282	367	465	542	635	711
18	112	201	283	370	467	544	636	
22	114	203	284	371	468	546	637	
24	115	206	285	372	471	548	638	
28	116	207	287	373	472	551	639	
29	117	208	292	375	473	553	640	
30	118	209	293	377	476	555	641	
31	119	212	294	380	482	559	642	
32	120	213	295	383	485	560	643	
33	121	215	296	384	487	562	644	
35	124	216	297	385	490	565	645	
36	129	217	299	387	491	566	646	
38	130	219	301	388	493	567	647	
39	131	222	302	389	494	571	648	
40	133	223	303	393	495	574	649	
41	134	225	304	395	496	575	650	
42	135	226	305	398	497	577	651	
47	137	227	307	401	498	578	652	
49	143	231	309	403	499	587	653	
51	144	233	312	404	501	589	654	
53	145	234	313	405	503	590	656	
54	149	237	314	406	504	591	657	
56	152	238	315	409	506	593	659	
61	155	240	316	414	507	595	660	
62	156	241	317	418	511	596	662	
63	157	242	320	419	512	597	663	
64	158	244	330	422	513	598	664	
65	159	245	333	423	514	600	665	
66	161	250	336	424	515	602	666	
67	164	251	340	427	516	603	670	
68	166	253	341	431	517	607	671	
70	167	254	342	435	518	609	672	
71	169	255	344	437	519	611	673	
72	170	256	345	443	521	612	674	
75	171	257	347	444	522	614	675	
76	172	265	351	445	523	616	677	
80	173	267	352	447	524	617	679	
82	177	268	353	450	525	618	680	
87	179	269	355	451	526	619	681	
90	180	270	356	453	527	620	683	
91	181	271	357	454	529	621	686	
94	182	272	358	455	531	622	691	

APPENDIX C: ADDITIONAL REGRESSION RESULTS

The least squares (LS) dependent variables reported in this appendix are: fair, which is the vector of responses to the question respecting the belief in the fairness of expecting landowners to pay for protecting endangered species; felon over family member of your district and felon over rural family member, which are the responses to the questions that aver a preference to socializing with a neighbor convicted of breaching the Bill or the **Saskatchewan Wildlife Act** over a family member who lives in a rural area or a family member who lives in the same rural area as the respondent who refuses to socialize with the neighbor purely because of the conviction; government cares, which is the vector of the responses to the assertion: "I do not believe that either the Government of Canada or the Government of Saskatchewan is particularly committed to the protection of endangered species"; and E1IN5, E1IN1000 and GR1IN1000, which are the responses to the avowal that the probability of detection is one in five, one in one thousand or greater than one in one thousand respectively. The independent variables were: c, the intercept; age, the age of the respondents; sex, the gender of the respondents; res, how large a population center that the residence of the respondents is located in; herd, the size of the respondents breeding herd; crp, the amount of crop land that the respondents' operations own and rent; and pas, the amount of pasture that the respondents' operations own and rent. The F-statistic is the statistic to test the joint hypothesis that the coefficients of the independent variables are statistically significantly different from zero. While the column headed t-statistic is the statistic to test the hypothesis that the coefficient of each of the independent variables is statistically significantly different from zero.

Appendix C Table 1 Additional Regression Results

LS // Dependent Variable is FAIR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.918868	0.770271	6.385896	0
AGE	-0.26012	0.090697	-2.86803	0.0053
SEX	0.895451	0.696665	1.28534	0.2025
RES	-0.22636	0.248549	-0.91072	0.3653
R-squared	0.175307	F-statistic		5.456021
Source: Survey				

LS // Dependent Variable is FELON OVER FAMLY
MEMBER OF YOUR DISTRICT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.602397	0.53248	8.643325	0
SEX	-1.00132	0.528201	-1.89571	0.0622
CRP	-0.05766	0.045158	-1.27678	0.206
R-squared	0.044658	F-statistic		1.589344
Source: Survey				

LS // Dependent Variable is FELON OVER A RURAL
FAMILY MEMBER

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.571559	0.532828	8.579807	0
SEX	-0.88296	0.532124	-1.65931	0.1017
CRP	-0.05105	0.042471	-1.20195	0.2336
R-squared	0.037109	F-statistic		1.31033
Source: Survey				

LS // Dependent Variable is GOVERNMENT CARES

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.595429	0.594765	4.363793	0
AGE	0.07906	0.093917	0.841813	0.4026
HERD	0.127787	0.084708	1.508557	0.1357
CRP	-0.04701	0.051481	-0.91318	0.3642
R-squared	0.057645	F-statistic		1.488509
Source: Survey				

LS // Dependent Variable is GR1IN1000

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.905136	0.924532	0.979021	0.3312
SEX	1.039856	0.774759	1.342167	0.1842
RES	0.439915	0.16679	2.63753	0.0104
HERD	0.122803	0.09633	1.274808	0.2069
R-squared	0.079728	F-statistic		1.877097
Source: Survey				

LS // Dependent Variable is E1IN5

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.364966	0.62307	8.610535	0
RES	-0.56339	0.101352	-5.55872	0
HERD	-0.17208	0.087868	-1.95841	0.0545
CRP	-0.12136	0.048385	-2.50823	0.0146
R-squared	0.168319	F-statistic		4.384978

Source: Survey

LS // Dependent Variable is E1IN1000

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.615917	0.847219	1.907319	0.0608
SEX	1.100346	0.857052	1.283873	0.2037
RES	0.384083	0.144258	2.662472	0.0097
R-squared	0.058883	F-statistic		2.06473

Source: Survey

APPENDIX D: AMENDED COST CALCULATIONS

TABLE 1

% crop and summerfallow by in project area by enterprise and soil class

enterprise soil class	wheat smf	stb	barley smf	stb	canola smf	stb	fallow
E	0.115	0.321	0.018	0.131	0.1	0.081	0.233
F	0.135	0.323	0.017	0.129	0.095	0.054	0.247
G	0.161	0.325	0.015	0.1	0.080	0.043	0.286
H	0.203	0.298	0.017	0.095	0.067	0.034	0.287
J	0.239	0.267	0.02	0.084	0.053	0.028	0.312
K	0.219	0.261	0.026	0.107	0.054	0.034	0.290
L	0.182	0.265	0.03	0.137	0.056	0.033	0.288
M	0.163	0.272	0.036	0.179	0.050	0.03	0.259
O	0.157	0.273	0.055	0.229	0.024	0.028	0.236
P	0.133	0.164	0.069	0.35	0.03	0.023	0.232

Source Gray et. al. p. 38

TABLE 2

expected yields in project area by enterprise and soil class

enterprise soil class	wheat smf	stb	barley smf	stb	canola smf	stb
E	32.59	26.05	49.95	42.55	24.44	18.45
F	31.72	26.11	48.76	41.29	23.87	17.75
G	30.72	25.14	47.46	40.01	22.82	16.93
H	29.6	24.02	45.82	38.36	21.86	15.96
J	28.3	22.72	43.84	36.37	20.89	14.78
K	26.72	21.11	41.53	34.08	19.78	13.89
L	24.82	19.21	39.86	31.44	18.49	12.54
M	22.55	16.69	35.48	28.04	16.91	11
O	19.58	14	31.28	23.86	14.89	9.06
P	16.5	10.94	26.99	19.56	12.86	6.94

Source Gray et. al. p. 34

TABLE 3
estimated cost of production by enterprise for soil class G

	fallow		wheat		barley		canola	
	smf	stb	smf	stb	smf	stb	smf	stb
projected input expenses								
seed	0	4.82	5.54	4.98	4.59	6.2	5.89	5.89
nitrogen	0	0.02	7.43	0.51	8.77	1.8	12.39	1.8
phosphorous	0	4.61	4.41	6.82	4.87	5.09	4.58	4.58
other fertilizers	0	0.38	2.12	0.73	1.86	1.03	2.95	1.03
herbicides	2.03	12.88	9.78	10.19	9.19	11.61	14.04	14.04
insecticides	0	0	0.05	0	0.03	0.85	0.84	0.84
hail insurance	0	0.23	0.29	0.3	0.44	0.99	0.44	0.44
miscellaneous	0.39	0.53	0.53	1.01	0.4	0.8	0.87	0.87
total inputs	3.32	23.47	30.15	24.52	29.75	27.77	42.68	42.68
equipment and building expenses								
fuel, oil and lubricants	3.85	5.22	5.97	6.19	7.85	5.16	6.78	6.78
repairs & maintenance	2.86	5.07	5.34	6.94	7.58	6.48	5.89	5.89
miscellaneous	0	0	0.82	0	0.44	0.15	0.28	0.28
indirect equipment expenses	0.61	3.38	3.73	2.37	3.55	5.28	4.93	4.93
total equipment expenses	7.12	13.67	15.86	15.5	19.4	17.05	17.88	17.88
other expenses								
labour	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87
property taxes	2.71	3.23	2.88	4.02	3.8	3.09	3.5	3.5
miscellaneous	1.33	5.19	5.83	6.46	5.85	6.2	7.61	6.2
operating interest	0.58	2.75	3.19	2.81	3.28	3.14	4	4
total other costs	10.48	17.04	17.75	19.16	18.58	18.3	20.98	20.98
total cash costs	20.93	54.18	63.56	59.18	67.73	63.12	81.54	81.54
depreciation buildings and eq	6.44	12.88	15.8	12.16	17.93	14.8	16.55	16.55
total cash and depreciation c	27.37	67.04	79.36	71.34	85.66	77.92	98.09	98.09

Source Gray et al. p. 37

TABLE 4
Adjusted costs for soil classification

	fallow	wheat	barley	canola	
	smf	stb	smf	stb	smf
adjusted total costs per acre E	27.37	71.12	85.07	75.10	83.45
adjusted total costs per acre F	27.37	66.22	82.42	73.29	88.40
adjusted total costs per acre G	27.37	67.04	79.36	71.34	85.66
adjusted total costs per acre H	27.37	64.60	75.82	68.87	82.13
adjusted total costs per acre J	27.37	61.76	71.72	65.90	77.87
adjusted total costs per acre K	27.37	58.31	68.64	62.43	72.96
adjusted total costs per acre L	27.37	54.16	60.64	56.41	67.31
adjusted total costs per acre M	27.37	49.21	52.89	53.33	60.03
adjusted total costs per acre C	27.37	42.73	44.19	47.02	51.08
adjusted total costs per acre P	27.37	36.01	34.53	40.57	41.88
					43.91
					40.21

TABLE 5

	fallow	wheat	barley	canola	
	smf	stb	smf	stb	smf
adjusted input costs per acre E	3.32	24.90	32.32	25.81	31.84
adjusted input costs per acre F	3.32	24.23	31.31	25.19	30.70
adjusted input costs per acre G	3.32	23.47	30.15	24.52	29.75
adjusted input costs per acre H	3.32	22.61	28.81	23.97	28.52
adjusted input costs per acre J	3.32	21.82	27.25	22.85	27.04
adjusted input costs per acre K	3.32	20.41	25.32	21.46	25.34
adjusted input costs per acre L	3.32	18.96	23.04	20.08	23.38
adjusted input costs per acre M	3.32	17.23	20.02	18.33	20.85
adjusted input costs per acre C	3.32	14.96	16.79	16.16	17.74
adjusted input costs per acre F	3.32	12.61	13.12	13.04	14.54
					15.65
					17.50

TABLE 6
expected gross returns GRIP j fallow

	fallow	wheat smf	stb	barley smf	stb	canola smf	stb
E	0	132.97	109.06	104.42	88.93	155.88	117.53
F	0	129.42	106.53	101.91	86.30	150.78	113.07
G	0	125.34	102.57	98.19	83.82	145.38	107.84
H	0	120.77	98.00	95.78	80.17	139.38	101.67
J	0	115.46	92.70	91.83	76.01	133.07	94.15
K	0	109.02	86.13	86.80	71.23	126.00	88.48
L	0	101.27	78.38	81.22	65.71	117.78	79.88
M	0	92.00	68.10	74.15	58.90	107.72	70.07
O	0	79.89	57.12	65.38	49.87	94.85	57.71
P	0	67.32	44.84	50.41	40.88	81.92	44.21

TABLE 7
expected net return

	fallow	wheat smf	stb	barley smf	stb	canola smf	stb
E	-27.37	53.55	18.85	20.18	-10.97	83.89	2.53
F	-27.37	51.92	16.10	19.48	-10.86	81.45	2.17
G	-27.37	50.04	15.23	18.78	-10.76	58.97	1.73
H	-27.37	47.95	14.24	17.84	-10.83	56.24	1.23
J	-27.37	45.52	13.08	16.73	-10.48	53.37	0.82
K	-27.37	42.58	11.84	15.42	-10.28	50.14	0.16
L	-27.37	39.00	9.95	13.92	-10.06	46.38	-0.55
M	-27.37	34.75	7.88	12.02	-8.78	41.78	-1.34
O	-27.37	29.17	5.30	9.63	-9.47	36.84	-2.36
P	-27.37	23.38	2.58	7.14	-8.15	29.88	-3.50

TABLE 8
crop insurance premiums

	wheat	barley	canola	
	smf	stb	smf	stb
E	1.54	1.27	2.4	1.34
F	1.52	1.25	2.37	1.3
G	1.5	1.22	2.33	1.28
H	1.46	1.18	2.26	1.21
J	1.43	1.14	2.24	1.14
K	1.38	1.09	2.19	1.08
L	1.34	1.03	2.12	1.01
M	1.23	0.86	2.04	0.82
O	1.23	0.87	1.97	0.82
P	1.19	0.78	1.94	0.74

Source Gray et al. p. 35

TABLE 9
expected rotation return

	fallow	wheat	barley	canola	under
	smf	stb	smf	stb	rotation
E	-6.38	6.16	5.41	-1.44	6.37
F	-6.78	7.01	5.20	-1.40	5.84
G	-7.28	8.06	4.95	-1.06	5.25
H	-7.86	9.73	4.24	-1.01	3.77
J	-8.54	10.88	3.49	-0.86	2.83
K	-8.18	9.32	3.04	-1.10	2.71
L	-7.34	7.10	2.83	-1.38	2.60
M	-7.99	6.86	2.09	-1.75	2.46
O	-8.46	4.58	1.45	-2.17	0.86
P	-8.35	3.11	0.42	-3.20	-0.81
					0.59
					11.07
					0.54
					10.75
					0.46
					10.84
					0.35
					8.54
					0.19
					8.31
					0.05
					6.23
					-0.15
					4.19
					-0.35
					1.49
					-1.77
					-0.58
					-5.45

TABLE 10
expected return 1/3 crop share
GRIP prices

	fallow	wheat smf	barley smf	canola smf	under rotation	landlord share	prairie CARE lease rates	CARE difference % large	CARE % large
E	-0.77	11.47	22.34	1.25	5.10	57.48	19.16	27.06	41
F	-0.82	13.08	21.71	1.15	3.25	55.19	18.40	26.22	43
G	-0.88	15.07	20.94	0.98	2.46	52.80	17.00	25.25	43
H	-0.95	18.28	18.25	1.07	4.08	49.52	16.51	24.14	46
J	-1.04	20.47	15.37	1.20	3.39	45.83	15.31	22.00	50
K	-0.90	17.82	13.82	1.47	4.00	42.52	14.17	21.41	51
L	-0.89	13.50	14.03	1.57	4.64	39.06	13.02	19.70	51
M	-0.86	10.88	10.98	1.70	5.28	33.74	11.25	17.00	56
O	-0.78	8.94	8.93	2.23	0.71	27.13	9.04	14.06	65
P	-0.77	6.22	3.93	2.33	0.44	20.28	6.75	12.15	80

TABLE 11
expected gross returns market prices

	wheat smf	barley smf	canola smf
E	81.48	67.38	132.95
F	79.30	65.28	128.76
G	79.80	62.85	124.14
H	74.00	60.05	119.03
J	70.75	56.80	113.64
K	66.80	52.78	107.80
L	62.05	48.03	100.59
M	59.38	41.73	91.90
O	48.95	35.00	81.00
P	41.25	27.35	69.06

TABLE 12
expected returns 1/3 crop share
market prices

	fallow	wheat	barley	canola	under	landlord	prairie CARE	CARE
	smf	stb	smf	smf	rotation	share	lease	difference % large
E	-0.77	6.33	10.84	2.61	4.25	34.03	11.34	27.06 -15.72 130
F	-0.82	7.23	10.57	2.49	2.73	32.10	10.70	26.22 -15.52 145
G	-0.88	8.34	10.23	1.87	2.07	30.55	10.18	25.25 -15.07 148
H	-0.95	10.13	8.06	1.70	1.54	28.00	9.33	24.14 -14.81 150
J	-1.04	11.40	7.59	1.42	1.09	25.06	8.56	22.00 -14.35 168
K	-0.99	9.85	8.68	1.69	1.34	23.95	7.98	21.41 -13.43 168
L	-0.89	7.80	7.07	1.99	1.17	22.03	7.34	19.70 -12.36 168
M	-0.86	6.17	5.94	2.31	0.94	19.25	6.42	17.60 -11.18 174
O	-0.78	5.14	4.73	1.17	0.87	14.89	4.98	14.98 -10.00 201
P	-0.77	3.65	2.21	1.25	0.45	11.42	3.81	12.15 -8.34 219

TABLE 13

Soil	Prairie CARE	One-third	Difference
Class	lease	crop share	
E	27.06	27.31	0.25
F	26.22	26.59	0.37
G	25.25	25.80	0.55
H	24.14	24.55	0.41
J	22.90	23.06	0.16
K	21.41	21.46	0.07
L	19.70	21.02	1.32
M	17.60	17.83	0.03
O	14.98	14.91	-0.06
P	12.15	11.5	-0.65

Source Gray et. al. p. 51